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Friday, June 10, 1892.

SIR THOMAS CRAWFORD, M.D., K.C.B., late Director-General Army Medical Department, in the Chair.

AMBULANCE WORK AND MATÉRIEL IN PEACE AND WAR.

By Mr. JOHN FURLEY.

As soon as I had accepted an invitation from the Council of the Royal United Service Institution to give a lecture in this theatre on "Ambulance Work and Matériel in Peace and War," though fully appreciating the great compliment, I found myself in front of an immense task. The subject proposed is a very comprehensive one, and it might easily be divided into three separate lectures: 1. Ambulance work in peace; 2. Ambulance work in war; 3. The manner in which the former can be made subservient to the latter. It is perhaps within my competence to deal in some measure with the first and third parts of the subject, but I naturally hesitate from venturing to express opinions on matters which are exclusively military. However, after a week's consideration, I accepted the flattering invitation, and I now trust that, whatever my shortcomings may be, and inadequately as I may perform the duty assigned to me, full credit will be accorded for a sincere desire on my part to assist, to the extent of my humble powers, in the solution of one of the most complicated and difficult problems of modern times, and one in which civilians have as great an interest as soldiers.

Although I am not in a position to treat this subject in the full and exhaustive manner which you have a right to expect from this place, I think I can understand why a layman should be invited to express an opinion on matters which are daily, and deservedly, engaging more public attention. Is it not because the subject is one which appeals to humanity, and in which every man, be he soldier or civilian, and,

indeed, every woman, claims to have a share? But I need your fullest indulgence, as the difficulties of my position are increased by the fact that for more than a quarter of a century I have been closely identified with practical ambulance work in well-nigh every part of Europe, both in peace and war, and the point of view from which I regard it is, in many respects, entirely different from that which the military administrator occupies. Whilst he is more or less bound by the rules and regulations of the Service to which he belongs, he probably looks upon me in the same light as did Dr. William Howard Russell, when, in a friendly spirit, he characterized me as a chartered libertine of philanthropy.

I need hardly assure members of the military profession that I have no intention to trespass on ground which properly belongs to them, but I am bold enough to think it quite possible that, whilst confining myself to limits within which I have had some experience, I may be able to show how, in some degree, the Army Medical Service can be supplemented in time of war, and how something may be gained by co-operation between military and civil organizations. If I appear somewhat egotistical, this must be attributed to the fact that, not being entitled to act as a critic of military institutions, I am obliged to bring forward the results of experiences shared with others, and of experiments due to my own initiative. The principal object in view, then, will be to indicate the points where civil and military systems touch.

And first I shall say a few words with regard to ambulance transport matériel. In this the stretcher is the most important element, and the essential features of its construction should be simplicity, strength, and lightness. As a modest inventor, I have also persistently striven to attain uniformity in size, if in no other respect. This uniformity is almost as necessary in peace as in war. How much suffering might be saved if all European Governments would adopt a uniform measurement for stretchers, that is, as far as the length and breadth are concerned. What gratuitous suffering is caused when a wounded man has to be moved from one stretcher to another, because one is made to fit a particular ambulance carriage and the other is not! If all stretchers were uniform in size, ambulance wagons would be, of necessity, constructed to take any of them, to whatever army such vehicles might belong. At the International Conference of Red Cross Societies, held at Geneva in 1884, Sir Thomas Longmore, M. Ellissen, of the Société Française de Secours aux Blessés Militaires, and I brought forward a proposition with this object, but without much success.

In peace this uniformity is equally advantageous, if not essential. When acting as the Director of the Ambulance Department of the Order of St. John, I endeavoured, and with some success, to obtain it. The work of the Invalid Transport Corps was thus very much assisted, and, as an interesting example, it may be mentioned that one of the first invalids, for whom arrangements had to be made for a long journey, was the late Lord Cardwell, who was brought from the Mediterranean to Eaton Square without a change, his lordship

remaining during the whole journey in a bed made upon one of the ordinary stretchers of the St. John's Ambulance Association. This could not have been accomplished without the knowledge that the stretcher would fit into all the carriages which were used.

It is true that a Minister of War, with the fear of a House of Commons ever before him, is in a very different position with regard to stores of matériel than is a civil association. The latter can make experiments and issue matériel by slow degrees on trial, but the War Department of a Government, having had stores manufactured on a large scale, cannot sacrifice these in order to adopt subsequent improvements, without a very considerable loss of time and money, a loss which might be sanctioned for weapons of offence and defence, but which, unfortunately, would not, under present circumstances, be allowed for ambulance purposes.

There are in the room, for the inspection and comparison of those who may be interested in such matters, two or three stretchers of different patterns. One is the present Army regulation stretcher, Mark V, the invention of Surgeon-Major Faris. No. 2 is known as the "Furley" military stretcher; this is, in its dimensions, quite uniform with the "Faris" stretcher, but it differs from it in certain important details. For instance, the Army stretcher has an independent pillow which is, I believe, never used at drill or taken out on field days; and on active service it is sure to become separated from the stretcher. Now, in the second pattern I have mentioned, it will be seen that the pillow is formed by doubling the canvas at the head and closing it with a lace; into this straw, hay, a coat, rug, or other soft material can be put when required. There are also two other stretchers which have been largely used by the St. John's Ambulance Association. No. 3 differs in few respects from No. 2, but it has an automatic pillow; and No. 4, to which attention may be particularly invited, differs from all the others, in that the handles are telescopic. Now, had it not been for fear that by asking too much I should lose all chance of gaining a hearing for other proposals, I should long ago have advocated the use of stretchers with telescopic handles in the Army; but such a change would involve many considerations which do not affect the civilian. It would mean some sacrifice of the existing Army stretchers, a change in the ambulance wagons, and also some alteration in the drill of bearer companies. Imagine the effect of such a suggestion at the War Office! Great advantage would, however, be derived if the proposal could be adopted. The stretcher might be reduced in length from 7 ft. 9 ins. to 6 ft. or 6 ft. 6 ins., and thus every ambulance wagon might also be made 1 ft. 9 ins. or 1 ft. 3 ins. less in length: besides this, the transport of sick and wounded by rail would be much facilitated, and in tents and temporary hospitals the passages could be kept clear of stretcher handles, which are so often knocked against, to the great discomfort of those lying on the stretchers.

The authorities who order wagons to be built to receive the long stretchers do not have the inconveniences brought home to them so strongly as they are impressed on civilian ambulancers, who are daily

occupied in endeavouring to adapt their stretchers to vehicles of ordinary length. In the Mark V Service wagon, which is a combination of Mark IV, the American wagon, and the South African trek-wagen, the disadvantage of long stretchers is very evident to anyone who will give the least thought to the matter, as holes are made in the tailboard in order to allow room for the handles. The exposure of the poles of a stretcher to rough contact is a very serious matter to a badly-injured man lying upon it, for in such a case occasional shock cannot be avoided. Besides, the holes admit a draught of air from end to end of the stretcher. Putting on one side all the difficulties in the way of a change, telescopic handles have everything in their favour from the stand-point of the patient, the medical Officer, and, I may add, the carriage builder.

It may also be remarked that stretchers with telescopic handles, the beds of which are generally made about 6 ft. or 6 ft. 6 ins. in length, are not only to be recommended because their adoption would allow ambulance wagons to be made of less length than at present, but also because they are more easily adapted to ordinary carts, wagons, and trains.

Military stretchers with telescopic handles can, certainly, be made to combine simplicity of construction and reliability as regards strength and endurance, whilst the increase of cost (if any) would scarcely be appreciable.

Those who have had to deal with the subject of mule pack-transport may be interested to examine a jointed stretcher which is shown here to-day. This stretcher, when opened for use, is very similar to the military stretcher of the St. John's Ambulance Association, which has already been mentioned; but the shafts are made of wood, jointed in two places, with telescopic handles. The stretcher can thus be formed into a compact parcel, 37 ins. in length, and 6½ ins. in width and height, and the weight being 29 lbs., six of them can easily be carried by a mule. This is a special military stretcher, not often likely to be required for civil purposes.

The next point to be noticed is that of two-wheeled litters. The policy of using such vehicles on active service will not, I think, be advocated in the present day by any military man; but in base hospitals and at home stations they are of the greatest use, and in Indian cantonments, or even during a prolonged siege, they might be found very useful. The "Ashford" litter was designed to meet the requirements of the St. John's Ambulance Association, and it has been adapted to the Service regulation stretcher, and is in use at some of the home stations. Here again, the advantage of uniformity is once more demonstrated. Let us suppose that a railway company has a stretcher at each of its stations, and an under-carriage at such of the stations as are within one mile of a hospital; in case of accident or illness on such a line, a patient arriving on one of the stretchers can be placed on any one of the under-carriages and wheeled without delay to a hospital. So, if ten or more stretchers are distributed over a town of a few thousand inhabitants, if one or two under-carriages are placed at convenient points, such as a townhall, a police office, or

a fire-brigade station, the bearers, if they have to take the stretcher any distance over a quarter of a mile, find relief for themselves and greater comfort for the patient by sending for an under-carriage to meet them on the road. Such under-carriages adapted to the regulation stretcher might often be conveniently used in the Army for short distances in preference to the ambulance wagons, which cannot be so speedily equipped.

The under-carriage of the "Ashford" litter has also been adapted to the Navy cot. Formerly, on the arrival of a ship in port, it was necessary to take an invalid out of his cot and place him on a stretcher, whilst by using this under-carriage he can remain in the cot until he reaches the hospital on shore.

And this brings us to the subject of ambulance wagons—a very difficult problem. If I were asked what army in my opinion possesses the best and strongest built wagons, I should unhesitatingly reply that it is the British Army, and I am afraid the answer would be the same if it were left to me to decide which army has ambulance carriages the least fitted for the conveyance of the sick and wounded. The reasons for this latter unfavourable comparison are chiefly due to two causes. In the first place, owing to the extent of this Empire and the variety of countries and races of which it is formed, Army ambulance wagons are made so that they can be rapidly taken to pieces and shipped to any part of the world; secondly, they are intended for a double purpose, namely, for the transport of stores as well as of invalids. I have no hesitation in asserting than no vehicle can properly meet these two requirements, as the springs which will bear a heavy load of stores are obviously unsuited when only three or four men and their kits are upon them. I am speaking from personal knowledge of these vehicles, in which I have made journeys of considerable length, and on those occasions I could but congratulate myself that it was not as a wounded man I was travelling.

Although a certain number of wagons specially intended for the carriage of the sick and wounded are absolutely necessary for every army, more attention should be devoted to the adaptation of means for making an ambulance carriage out of any country cart.

The expression "improvised methods of ambulance transport" is a very favourite one, but these improvisations are generally the result of much thought and of many experiments. We also know that in actual war they signally fail for want of the very simple material, without which the arrangements cannot be completed. "Improvised means of ambulance transport" is a phrase which ought not to be allowed in the Service, because it implies the postponement of preparation until a time when the greatest strain is put upon all resources, and it may not be possible even to extemporize. It is different in civil life, when we have only to deal with individual cases, and when those who have thought out the matter beforehand can generally find what they want.

The nearest approach to a real improvisation of ambulance material that I ever saw was the use which the late Surgeon-Major

Porter made of telegraph wire, which he found torn from the posts and scattered about the country in 1870 during the Franco-German War. Doubtless he had already decided what use he could make of wire, and fortunately he found a supply at hand, and of this he manufactured splints on the spot.

Both for civil and military purposes, too much time cannot be devoted to this subject of extemporized means, but as it is acknowledged how much can be done with the simplest things, such as rope, wire, canvas, iron staples, &c., I would strongly recommend that the employment of these be not neglected in favour of more costly and complicated appliances.

It appears to be the impression in some quarters that wherever a gun can be driven there also an ambulance carriage can be taken, and that for this reason such vehicles should be of the strongest description. I have seen empty ambulance wagons driven over broken country and the attempt made to bring them back again with wounded men in them; but it is doubtful if any Officer who had tried this once would repeat the experiment. Confining myself to Europe, I am inclined to believe that it is scarcely ever necessary for ambulance wagons to be taken off the roads, except when they can be driven over comparatively smooth ground, or it may be necessary to move them out of the way of a marching column. I have never known an instance in which the removal of wounded to ambulance wagons was not more speedily performed by leaving the wagons on the roads or on ground not intersected by ditches or other obstacles, and carrying them on stretchers to the wagon stations, even if the distance were 300 or 400 yards, and this plan certainly saves an agony of suffering to the patients.

All this, and if I am wrong there are those present who can put me right, tends to show that there need not be that great difference of construction between such ambulance carriages as can be used for civil purposes and those which have to accompany armies in the field. Absolute similarity is, for many reasons, impossible, but military ambulance wagons might be much better adapted than they are to the purpose for which they are intended.

Whatever opinions may exist as to wagons for use during a campaign, is there any reason for maintaining one type of ambulance wagon for all circumstances and all countries? The *sine quâ non* of Army ambulance wagons is that they should be able to take two regulation stretchers: but is it necessary that they should all be alike for peace or war, winter or summer? Is there a single one of these vehicles in the Home District at the present time in which one of us would care to be moved, say, from Woolwich to London? Had these wagons ever been tried by English Officers as, in common with many distinguished Officers, I have tried various patterns in use on the Continent, at the trot and the gallop, over smooth and rough ground, I am quite sure that some of the vehicles now in use would long ago have been condemned as lumber. It is only by trials such as these to which I have just referred that a right estimate can be formed, and even then every allowance must be made for the different

circumstances of the men who in a state of vigorous health submit, by way of experiment, to be carried on stretchers and then placed in these wagons, and those who, mangled by shot and weakened by loss of blood, have no choice left to them. No doubt apologists can be found for the wagons which for use in active service I have so unhesitatingly ventured to denounce; but will anyone defend their use in time of peace in our towns and on macadamized roads?

With the proviso I have mentioned that each wagon should be of a standard length and breadth, there is no reason why for home service our soldiers, when invalided, should not be carried from one place to another as comfortably as the civilian, or why they should not have as good springs to the carriages and as much protection from exposure to draughts of cold air. I never see one of our Army wagons with the red cross painted on it passing through the streets or along the country roads, but I invariably groan at the suffering entailed on those who are compelled to use them. I trust the time is not far distant when, at any rate for home service, all invalids, whether soldiers or civilians when they have to be moved, will be conveyed in carriages with comfortable springs and so covered as to exclude cold draughts.

I should not speak as I have been doing if this subject were new to me. In other countries I have travelled with wounded men in carriages which left little to be desired, and these vehicles stood the test of war. As an amateur I have also superintended the manufacture of a large number of carriages which have been built on my own patterns. I do not pretend to say that these are perfect, but I think, without undue vanity, I may assert that they tend in the right direction. I have made mistakes, but these very mistakes have been of some assistance to others. One of the first vehicles I had built was partly designed, though for civil use, on a military pattern, and the body was formed of a strong frame with canvas curtains, but I soon found that in this climate curtains were not proper for such a purpose, and therefore I never again used them except in an ambulance carriage designed for Cairo. These two carriages, one for Yorkshire and the other for Egypt, illustrate my argument that the British Army, though requiring carriages with an interior measurement of one uniform size, must alter the actual construction of them to meet the great variety of circumstances with which it has to contend.

Of the seventy civil ambulance carriages to which I have referred as having been built under my direction, all those of most recent construction have been made not only to take stretchers with telescopic handles, but also the Army regulation stretcher, so that they can be utilized for districts where they happen to be, and these might be usefully registered at the War Office. The plan for adapting a carriage of ordinary length to the Army stretcher is so simple that, I think, there is more probability of its adoption than that the pattern of the stretcher will be changed.

For many years I have strenuously opposed the use of horse ambulance vehicles on two wheels, but the altered conditions of war,

to which I shall presently refer, have compelled me to modify my opinions. The distinguished Austrian surgeon, Professor Billroth, states that in future it will be necessary to place a great number of light carriages even close behind the line of battle, for the purpose not only of transporting the wounded to the field hospitals, but also to remove them from the battle-field itself, provided that the ground allows it. Although I do not like to use carts with two wheels if it is possible to have them with four wheels, I must admit that they are occasionally very useful, especially on ground where a heavy wagon would probably become bogged.

The two-wheeled cart designed by Colonel Close, R.A., is very ingenious, and there is much in it to admire; but it is very heavy and expensive, it requires two horses, and altogether involves a waste of power. If a two-wheeled vehicle must be used, I prefer the little French ambulance cart, which can be drawn by a single horse or a mule. I have used such carts, each carrying a stretcher and one or two men seated, on ground where heavier carriages could not have been employed.

There is on the wall the drawing of a cart which, I think, might prove very useful; it will carry two men on stretchers and two seated, or six slightly wounded men seated. There are also racks for the rifles and kits. When wounded men are conveyed in a two-wheeled cart, the animal in the shafts should always be led, and not driven.

Mule cacolets still have their advocates, but for European warfare, except in the Alps, I am not disposed to give them any consideration. Even in the Pyrenees, during the last Carlist war, it was very seldom that wheeled transport could not be employed. The cacolet is practically an instrument of torture, and it should never be used if any other means of conveyance be possible.

As might be expected, more attention has been devoted to the subject of railway ambulance trains on the Continent of Europe than in this country. Here the distances are so much shorter than on the Continent, especially as such trains may be utilized from one country to another, as was done in 1870–71, when admirably arranged ambulance trains ran between the army before Paris and Metz and different parts of Germany. The most complete trains of this kind are to be found in France and Austria; these are chiefly due to the initiative of Baron Mundy, and in the latter country they are provided at the expense of the Order of Malta. In Germany special attention has been paid to the conversion of luggage vans for this purpose; and this system has also been adopted in Italy, where I recently had an opportunity of seeing a complete train so arranged, and of appreciating its merits in the course of a journey between Rome and Tivoli. In England, as far as I am aware, only two railway ambulance carriages exist, and these are intended chiefly for use between Southampton and Netley; but there is good authority for believing that, if ever the occasion should arise, the railway companies would be quite equal to it, and ambulance trains could be made up and run at short notice.

I must repeat that I have not much faith in "extemporized" methods, unless they have been carefully thought out and the necessary material prepared beforehand. With very simple means, ambulance trains can be readily arranged, but the first point is to select the vehicles which can be most readily adapted for the conveyance of seriously ill or wounded patients; the ordinary carriages will answer the purpose for cases of less gravity. Roughly speaking, it has been found that the luggage vans used on express trains are the best for such use, as they are well built, and the springs are superior to those on the vans of ordinary passenger or luggage trains, being longer and more elastic.

If Great Britain were engaged in a war on the Continent of Europe, or in Canada, it would be absolutely and immediately necessary to bestow more attention on this subject than has hitherto been done, and we could not do better than be guided by the experience of those States in which sanitary trains have already been largely used.

In arrangements for invalids on board ship, our experience is probably superior to that of any other country, but more attention might perhaps be bestowed on river and canal transport, for which the last Egyptian campaign has prepared the way in a very practical, though costly, manner.

Even such a brief allusion to ambulance matériel as I am able to make in this paper cannot omit some reference to the subject of portable hospitals, to which much attention has been devoted during the last few years. It was the late Empress Augusta of Germany who first gave a practical impetus to the consideration of this important question, and I may add that her name will ever be associated with the Red Cross and gratefully remembered by those who work under its flag. The patronage of the Empress Augusta was not merely nominal, but it was practical and intelligent, and she took an active part in everything which could tend to the development of Red Cross Societies, an interest which was not confined to Germany, but was extended to every country in which these and kindred societies exist.

In 1885 Her Majesty gave valuable prizes for the best portable barrack hospitals, and the competition took place at Antwerp. Three years later she gave other prizes on an equally liberal scale for the best equipment of such hospitals. As I had the honour to be a member of each of the international juries to which the decision was entrusted, I naturally feel more than ordinary interest in this matter. The result of these trials has been most practical and satisfactory, but we have not yet seen the whole of it. The first prize for the best portable hospital was given in 1885 to Messrs. Christoph and Unmach, of Copenhagen, for their hospital built on the system of the Danish Captain von Doecker: this is admirably adapted to meet the requirements of European countries the most widely different with regard to climate.

Recent experiments have, however, shown that, whilst under certain circumstances these portable houses may be of the greatest advantage, we cannot altogether dispense with the use of tents.

The most exhaustive trials that have yet been made of the two systems were carried out at the express desire of the Empress of Germany, who, in this respect, is following in the footsteps of the Empress Augusta. These experiments were made at Tempelhof, in the vicinity of Berlin, and the temporary hospitals were ready for use by invalids on the 1st July last, and continued to be thus occupied for six months, so that the extremes of temperature were experienced. Though it would take too much time to enter into all the details of these trials, it may be briefly stated that in some respects, especially for durability, the preference was given to the more permanent barrack, but for portability and rapidity of construction and installation the decision was in favour of the tents. The report admits that each system possesses special advantages: the Doecker barrack is more portable than any hut yet invented; it can be easily disinfected, requires to be painted only at intervals of two or three years, and it is particularly well adapted to retain a warm temperature in the autumn and winter; but, on the other hand, its construction occupies more time than could be allowed in case of the rapid mobilization of an army.

The double canvas tent can be manufactured in a few days, and put up and furnished ready for use in the course of an hour by three or four men; it is more airy than the portable hut, and is thus better adapted for the summer. It bore the test of very severe cold; it is, however, less easy to disinfect than the former, and is certainly less durable, but it is cheaper.

The final decision arrived at was that neither system could in every respect be absolutely preferred to the other, but that the advantages of both should be utilized. In time of peace, and when remote from the field of active operations in war, the Doecker huts can be recommended, but during war and in the second line the double tents have many advantages.

I may supplement these remarks on portable hospitals by inviting your attention to the ingenious invention of Captain Tomkins, which gained one of the Empress Augusta's gold medals, and of which there is a model in this hall, for the inspection of those who are not already acquainted with it. The "Tortoise" tent is a most useful addition to ambulance matériel, both for peace and war. For peace a movable hospital has long been wanted, not only for great casualties in which there are many sufferers, but also in epidemics. It would be better in such cases, especially in the provinces, to take a hospital to the spot where it is required than to remove the sick and suffering to town hospitals, which perhaps may be already full. The pioneer in this matter was, I think, Mr. Albert Napper, of Cranleigh, to whom we owe the origin of cottage hospitals. I endeavoured to assist in the same direction, but, until the competition for the prizes offered by the Empress Augusta, in 1885, no actual progress was made; we are now, however, within measurable distance of such a hospital as that advocated by Mr. Napper. Many occasions arise in time of peace when the "Tortoise" tent might be used with most beneficial results, such as great colliery accidents or shipping disasters

on the coast. I have had personal opportunities of estimating the value of these tents, once during great heat in Germany, and, for a longer period, during very cold and damp weather in South London, where for a month a number of invalids occupied one of them as a hospital.

This tent can be used without the wagon in which it is usually carried, and it is arranged to be borne by horses, mules, or even by men; but the wagon gives a greater value to the tent, as with it there is a hospital complete with beds, furniture, &c., for twelve or twenty beds with cooking apparatus and stores, and this can be extended in proportion to the number of "Tortoise" wagons available.

The "Tortoise" tent has been tried at great military manœuvres in France, Russia, Finland, Denmark, and Austria; it has been adapted to the ambulance wagons of these countries, as well as to those of Germany and Turkey, and it is well known at Aldershot and Bisley. One of its great merits is, as has been recognized on the Continent, that it can readily be adapted to existing military wagons, and this forms a strong recommendation to War Ministers who are dependent on Chancellors of the Exchequer.

I am glad to have this opportunity to congratulate Captain Tomkins on the ingenuity, energy, and pluck he has for many years displayed. Old Volunteers, like myself, can recollect his cooking stoves in the Victoria Camp at Wimbledon, and the hospitality these camp kitchens encouraged. By steady stages he has persevered until his modest stove has developed into a complete portable barrack, which is useful for a variety of purposes: for ambulance work in peace or war, for soldiers on the march, and also for sporting and exploring expeditions. The "Tortoise" has already made the tour of Europe, and it is not too bold a prediction to assert that, give it time, it will make the tour of the world.

Thus far my remarks have been confined to ambulance material. I now propose briefly to indicate how the Army Medical Corps might in time of war be supplemented by civilian aid. It would be an impertinence on my part to attempt to describe, much more so to criticize, the Medical Department of the British Army. There are gentlemen present who know far more about it and its resources than I can pretend to do. Nor do I intend to express any new ideas with regard to the Volunteer Medical Staff Corps, a valuable body which is capable of great development; or as to the latest organization sanctioned by the Secretary of State for War and the Commander-in-Chief on the recommendation of the Director-General, which will provide a Militia battalion for the Medical Staff Corps. I shall limit myself to that which is more within my own personal experience, and to the consideration of the assistance which might be rendered by a purely civilian element, especially in relation to home service.

The work of the Red Cross Societies may be compared to our Volunteer Army as some of us remember it during the first years of its existence. It sprang into being with such rapidity that it quite astonished the military authorities when they suddenly found them-

selves in charge of a supplemental Army. The control of this body was divided between the Lord-Lieutenants of Counties and the military chiefs, and the eccentricities of men who exhibited so much patriotism and who so freely gave not only their time but also their money towards the national movement were not too severely regarded. Gradually the character of the force was changed, and brought into harmony with the existing military institutions of the country, and much as the present Volunteer Army differs from what it was during its earlier years, there can be no doubt that it is now a most efficient and valuable addition to the Regular Army.

So it is with the Red Cross Societies. The Convention of Geneva was signed on the 22nd August, 1864, and the first war in which any of these societies took part, though to a comparatively small extent, was the Bohemian Campaign of 1866. Most of the European Aid Societies put forth their full strength during the Franco-German War in 1870–71, and we know what was done by the British National Aid Society, under the able direction of Lord Wantage; and, as women had a large share in this, may I also be permitted to name Lady Wantage, who assisted so materially towards the good results. But time has shown that such freedom and latitude as was then allowed, under the press of new and abnormal conditions, will never again be permitted to Aid Societies, nor do I think they should be. No doubt, in a Continental war, there will always be considerable irregularity in the way that neutral States in the neighbourhood of the belligerents will afford aid to the sick and wounded, should a great battle occur in close proximity to the frontier. No regulation will, under such circumstances, be quite effectual in stemming the current of philanthropy which will inevitably be let loose regardless of Conventions. We witnessed this in 1870 on the frontiers of Belgium, Luxemburg, and Switzerland. But such occasions are exceptional and no more affect the broad principles of the Convention of Geneva than do the kindly acts of people whose neighbours' house is on fire affect the law of trespass. The great and terrible experience of the Franco-German War and of subsequent campaigns has considerably modified such opinions as were previously held with regard to the Convention of Geneva, and although very liberal notions are still entertained, especially in this country, as to the right of benevolent neutrals, these will, I think, have received a severe shock on the outbreak of the next European war. The fact is, to follow out the comparison I have already made, the Red Cross Society of a nation will henceforth bear the same relation to the Medical Department of its Army as the Volunteers in this country maintain towards the British Army. The great military Powers of Europe have recognized their necessity, and the philanthropic ardour of the Red Cross Societies has not in any way been diminished by the efforts which have been very successfully made to bring them under strict military administration in time of war. The great secret is to allow to each society the fullest liberty to manage its own affairs during peace on lines agreed upon between the War Minister and the official representative of the Society, then when war is imminent the whole of

this Volunteer supplement can be readily mobilized and it becomes virtually a part of the national Army.

I have more than once described the plan adopted by Continental States in order to produce this result. On the present occasion it will, perhaps, be sufficient if I take France and Germany as the best illustrations. It would afford me infinite satisfaction, if in a humble measure my words could have some effect in this country, and if, learning from the dearly-bought experience of others, we might be induced to adopt a somewhat parallel system. The first step in this direction should be the appointment of an Officer (of high military rank if possible) to represent the civil Aid Societies at the head-quarters of the Army.

In France the Red Cross Society holds a very prominent position. The Central Committee of Paris has, since its formation, maintained intimate relation with the military authorities, and it corresponds directly with the Minister of War through the medium of its President and with the Generals Commanding Army Corps, by means of delegates officially appointed. On the 3rd July, 1884, a Decree was passed with the object of bringing the Society into conformity with the changes that had taken place in the Army since the war of 1870–71, authorizing the *Société de Secours aux Blessés des Armées de Terre et de Mer* (the official name for the Red Cross Society of France) to supplement in time of war the military sanitary service, to distribute gifts offered by public generosity, to establish hospitals in places that may be indicated as requiring them, to render assistance in the transport by railway of sick and wounded soldiers and sailors, in the railway station infirmaries, and in all the auxiliary hospitals at the seat of war. Since this Decree, two others have been passed, dated respectively 16th November, 1886, and 21st December of the same year. The first recognizes *l'Association des Dames Françaises*, and the second, *l'Union des Femmes de France*. These Decrees limit the co-operation of the Aid Societies with the military medical services to the rear of actual hostilities and to the national territory.

Independently of this assistance the societies are authorized to distribute to the sick and wounded the gifts they have collected. The relations of the societies with each other and with the Official Director of the Military Service are defined by the above-mentioned Decrees. Every establishment of the aid societies is under the surveillance of the Principal Medical Officer of the district in which it is situated, who also superintends all the documents and registers prescribed.

The personnel of the three societies I have named is authorized to wear the uniform and badges prescribed by the Minister of War. All associations in France which, more or less, pursue the same object and which cannot be recognized as independent societies, are required in time of war to become merged in the Central Society, that is the *Société de Secours aux Blessés des Armées de Terre et de Mer;* there is only one exception to this rule, and that is in favour of those strictly local ambulances whose action does not extend beyond the communes where they are established.

At many of the most important railway junctions on the principal lines between Paris and the frontier of France, not only have certain rooms been apportioned for the use of the Société de Secours, but a large personnel and all other requisites for hospital use have been allotted for the same purpose. On the outbreak of a war, each of these temporary hospitals can be established and placed on an active footing as rapidly as the mobilization of the army can be effected; and, besides this, the delegates of the society are charged with the useful duty of bringing back invalids from the front and accompanying the railway ambulance trains. These movable and stationary hospitals form the special work of the *Societé de Secours aux Blessés Militaires* in time of war, and they offer a large scope for the exercise of national philanthropy without the danger and inconvenience to which reference has already been made.

Great attention is also paid by this French society to the constant improvement of ambulance material; depôts have been formed in thirty-nine towns corresponding with thirty-nine territorial divisions of the Army, and trials of this material are annually made at the periods of the great military manœuvres. Moreover, schools of instruction for ambulancers and nurses have been established in Paris, and also at Marseilles, Lille, and Nancy.

In Germany, in time of peace, the fullest independence is allowed to the various aid societies which exist in all the States of the Empire, but on the outbreak of war the direction of all the different branches falls to the Central Committee of German Associations of the Red Cross, a body composed of delegates from the societies of all the States, acting under the control of a Commissary Inspector on behalf of the Imperial Government. Many hundreds of committees working in correspondence with the Central Committee of Berlin are scattered over Germany, and the result of this system is evident in the many admirable institutions which do so much good during peace whilst preparing for possible war.

One very important branch in Germany, as in France, has been the formation of depôts of ambulance material, divided into four distinct categories and placed under the management of a Commission of Surgeons and lay delegates of the Central and Ladies' Committees. The articles contained in these depôts are again subdivided into such as are absolutely necessary and those which may be useful. Models and patterns are from time to time issued for the use of all the affiliated societies, and in the same manner instructions are given as to the changes and improvements to be made.

The two examples I have chosen as illustrations of Red Cross work, as it is understood in France and Germany, are sufficient to show the manner in which the objects of the Convention of Geneva have been developed in most of the European States. The results have been so satisfactory, and of such wide-reaching importance, that criticism has been silenced. At any rate, when mistakes have been made, they have been of such a character that here in England they would be condoned, even if they did not receive full absolution. We in England have no sympathy for any scheme which locks up great

moral and material resources for a time of trouble which it is hoped may never occur. We, therefore, would allow the fullest indulgence to those who, whilst preparing for war, utilize to the uttermost the generosity of their subscribers and the energies of their personnel in meeting the calls of charity and philanthropy on the vast battle-field of daily life. This is no exaggerated expression, as those will admit who have studied the question in this large Metropolis, or amidst the teeming population of our great industrial and manufacturing centres.

I apprehend that there is no one who believes that the medical department of an army can ever be made fully adequate to the emergencies of great and frequent battles. It was the general recognition of this which gave birth to the Convention of Geneva, and the numerous volunteer societies which subsequently came into existence; and it is this knowledge which will continue to enrol men and women under the emblem of the Red Cross. In 1871 I first publicly advocated the desirability of organizing an ambulance system in peace for the requirements of civil life that might also furnish, if needed, a valuable supplement to the Army Medical Department in time of war; and during all the years I have been connected with the St. John's Ambulance Association I have never lost sight of this object. I was in good company: from the very first I was guided by the advice and experience of Sir Thomas Longmore, who is regarded throughout Europe as one of the greatest authorities on this subject; and more recently we had the valuable co-operation of the late Colonel Duncan, whose eloquent and powerful advocacy of first aid to the injured is still fresh in the memory of those whose privilege it was to be associated with him.

Aid to the sick and injured is quite as necessary in time of peace as in time of war; but whilst preparation is possible in peaceful circumstances, no satisfactory system can be hurriedly organized amidst the turmoil and excitement of war. The examples which I have already drawn from France and Germany show the manner in which volunteer ambulance assistance is understood in these two countries. The distinctive character and institutions of each nation prevent anything like a uniform plan being adopted in all countries, but I venture to submit that, with the machinery we already possess in England, we are in a position to place ourselves, in respect to the administration of aid to the sick and injured, both in peace and war, on a level with any of our neighbours. There is much which we can learn from them; but there is also much we have taught, and are still able to teach them. And having been permitted to take part in the first establishment in Germany of the Samariterverein, it is a satisfaction to me to think that this flourishing institution owes its origin, in a great measure, as its founder Baron von Esmarch admits, to the example of the St. John's Ambulance Association, and that it is now extending its influence through neighbouring States. The field of humanity is a large one, and, fortunately, it is one from which national distinctions promptly vanish. We can realize this when we see wounded enemies lying side by side under the same roof and receiving

equal attention from doctors and nurses, regardless of nationality; but it is well to realize at once that, however admirably a plan may be adapted to peace purposes, it cannot be extended to meet the demands of war unless it be incorporated as a part of the general military system, and this during a period of peace.

It is unnecessary to occupy your time in describing the work of the St. John's Ambulance Association, as this is so fully understood and appreciated throughout the British Empire; but it may be well to explain what has been done towards making this civil institution of great value to the British Army in case of war. It is quite true that at present this does not amount to much, but a very little encouragement on the part of the War Office might lead to a development that would have the most beneficial results for our soldiers and sailors.

A few years ago, in order to increase the usefulness of, and maintain an interest in, the work of the Association, small ambulance corps were organized, and these have since been formed into the St. John's Ambulance Brigade. The object was at first limited to local needs, but with the desire that war should be taken into consideration as well as peace, I was fortunate in finding a corps which had no hesitation in venturing on an experiment which may perhaps help to solve a problem.

Amongst the colliers of Derbyshire, one of the earliest ambulance centres was formed at Tibshelf in 1878, and this has not only been steadily maintained there ever since, but the results it has shown have encouraged other mining establishments to follow the example thus set, and which is due in a very large measure to Captain Stuart Wardell. The Birchwood pits, which are under the same management, also formed a centre in 1882, and the Medical Officers warmly testify to the good that has been done by these two bodies in minimizing the effects of the accidents, which are unfortunately of frequent occurrence. In each of these centres a corps of the St. John's Ambulance Brigade was formed in 1889.

Having been elected an honorary member of the Tibshelf Corps, a position of which I am very proud, I suggested that the members should submit to a similar drill to that given to the bearer companies of the Army, and in a very short time, under the instruction of Captain Wardell, assisted by competent Army sergeants, my wish was realized. The next step was to obtain permission for an official inspection. With the sanction of the Secretary of State for War, the Director-General of the Army Medical Department, Sir William Mackinnon, K.C.B., and Surgeon-Major Allin, A.M.S., inspected the Tibshelf and Birchwood Corps of the St. John Ambulance Brigade on the 28th July last. The field state showed that there were on the ground 180 Officers and men, all of them clothed in a neat and serviceable uniform, and they had with them two horse ambulance wagons.

Probably it may be permissible, without indiscretion, to give the reports of the Inspecting Officers *verbatim*:—

From Surgeon-Major Allin, M.D.

To the Director-General Medical Division,
Horse Guards, London, S.W.

Rawal Pindi, Punjaub, India,
December 7, 1891.

SIR,—

I have the honour to make the following report on an inspection of Captain Wardell's ambulance corps on July 28th, 1891, at Tibshelf. The parade consisted of an inspection of the general turn-out and equipment of the corps, the application of the triangular bandage; the formation of two-, three-, and four-handed seats; stretcher drill; the application of first-aid dressings; the lifting and lowering of the wounded on to stretchers; carrying to a collecting station and loading ambulance wagons.

I was much impressed with the turn-out and clean appearance of the whole of the members of the corps; the application of the triangular bandage and the formation of the handed seats were most creditably done.

Nothing could be better than the way in which first aid to the wounded was rendered and the dressings applied. The men had been thoroughly trained, both in the application and uses of the various appliances, and seemed to have a very intelligent comprehension of the subjects in which they have been trained. Great credit is due to Captain Wardell and his Officers for the thorough way in which the members of this corps have been equipped, trained, and taught, and the greatest praise to the non-commissioned officers and men for the very evident interest taken, and appreciation shown in the work.

I have the honour to be, Sir,
Your most obedient servant,
(Signed) W. B. ALLIN,
Surgeon-Major, M.D.

To this the Director-General of the Army Medical Department, Sir William Mackinnon, K.C.B., added the following remarks:—

I was present at this inspection and was very much pleased with the highly creditable manner in which the men went through their drill, as well as the proficiency they displayed in the different methods of dressing and bandaging, and placing and moving men on the stretchers.

The training of these men has evidently been carried out with much care, and reflects great credit on Captain Wardell.

In case of war, this body of well-trained men would form a valuable addition to our resources for sick and wounded in the district, and in the event of their services being required, it would be a wise step to attach them for duty to the military district, if they so desired.

(Signed) W. A. MACKINNON, D.G.

January 16, 1892.

It is an unpopular thing to admit that it is possible for a foreign foe to land on our shores; but is it not worse than folly to refuse to face such a possibility, great as our faith may be in the strength and ubiquity of our Navy? This being the case, nothing should be neglected that might help to diminish panic if the landing of a hostile force were threatened or effected. And not the least important step in this respect would be an arrangement for the care of the sick and wounded of the contending forces, without making too great a call on, or dislocating the ordinary work of the civil hospitals of the country. To meet this essential part of a complete military organization, my belief is that, at the present time, such an ambulance corps

as I have described might be formed in every one of the military territorial divisions into which England is divided.

But it is not only in the event of a hostile invasion of our shores that such a body of ambulancers would be of great value. If this country were engaged in a war abroad which should necessitate the putting out of the whole available strength of the nation, what an incalculable advantage it would be if the Army Medical Corps could be left free for foreign service! and I am sure this could be done. We have now in England the means on which the Government might rely in case of either emergency, and to utilize these it is only necessary that we should break away from some of our ideas as to insular impregnability and not a few notions as to bureaucratic infallibility, and improve on the example that has been set by some of the great Continental Powers of Europe. I will go even further, and assert that, late as we are in following examples to which we have long accorded a Platonic admiration, we are in actual possession of the personal and material means, which only require to be organized in harmony with our national character and institutions. As ambulance corps have proved of the greatest use in time of peace, and many already exist, each territorial district would soon have a body of men, with its proper complement of Medical Officers, and this at very small expense. The military training should be made as little irksome as possible to the men, and periodical inspections should take place on their own ground, for those who are the best ambulancers in the country are generally industrious workmen in the receipt of good wages, which they could not afford to sacrifice. Besides, the practice in first aid to the sick and injured, which is almost within their daily experience, renders it quite superfluous that they should be compelled to waste time in exercising on imaginary wounds, and there is no doubt that within one month in their own locality they gain, in daily experience, more knowledge in the dressing of wounds and the handling of injured men than they could acquire in a year spent at Aldershot.

In our comparatively small Army men cannot be spared from the combatant ranks; and now that the height and chest measurement of the men recruited for the Army Medical Corps have been reduced, the majority of the bearers are not equal to that work which the changed circumstances of modern warfare demand. No opportunity, therefore, must be neglected for supplementing this service with capable men, and we have at hand a field from which men of good character and admirable physique may be drawn for home service, and many of whom would volunteer for foreign service in case of emergency.

It would also be in many ways a great advantage if such a corps as this could be formed in each of the principal ports of the kingdom, officered by their own local doctors. In the event of a foreign war in which our own Army and Navy might be engaged, the sick and wounded, on being landed, could be treated on the spot. Under official control and inspection I believe that this plan would be found to work admirably well, whilst it would set free a large number of

Officers and men of the Regular Army whose services might be needed elsewhere. The philanthropy and patriotism of the country may be fully relied on, and, if necessary, not only the personnel but the hospital matériel also would be forthcoming. The whole of this might be done at a pecuniary cost so insignificant that it is scarcely worth consideration.

It would be well for the military authorities not to allow themselves, in this matter, to be trammelled by old traditions, but to meet one of the great difficulties with which they are now confronted in a bold and statesmanlike manner. Germany can produce corps of ambulancers who have served their time in the ranks, and, judging from what I have seen, these volunteers are a valuable addition to the Army Medical Corps; but the men whose employment is here advocated afford a far better guarantee that the sick and wounded would be well and conscientiously treated, although, from the point of view of a drill sergeant, they may not be so well set up and their appearance on parade may lack some of that smartness which is expected from soldiers.

I have already described the systems adopted in France and Germany, under which the Aid Societies are now organized, and some months ago I publicly stated my conviction that in future Red Cross Societies would not be allowed to act as they have done in late campaigns, but their services would probably be confined to the lines of communication from the second line of medical assistance to the base. But these are days in which we move very fast, and in no respect is this more evident than in the art of war. Within the short period that has elapsed since I ventured to print an opinion that volunteer aid would not be permitted in the first line, a great change has taken place. No official sanitary corps in any army has ever been adequate to the requirements of a great battle; it was this fact which compelled the adoption of volunteer aid by every civilized State. Under the conditions which existed previously to the introduction of the latest form of offensive weapons, it was naturally thought that this volunteer supplement of aid might be kept in rear, on the lines of communication, where, with proper organization, it would leave the Army Hospital Corps entirely free for service at the front: but, under the altered circumstances, it may be confidently predicted that an army which shall enter on the next war without a strong reserve of volunteer bearers, within easy distance of the front, will soon find itself in a terrible dilemma. The only alternative to such a difficulty would be in the event of a battle being fought, like that of Sedan, close to the frontiers of States, whose whole populations were ready to give all the assistance in their power for the relief of the wounded. It must not, however, be forgotten that this was a very exceptional case: the battle was a most decisive one, and the victors, being complete masters of the situation, were not inclined to criticize too closely the acts of those who relieved them of an enormous responsibility. In a word, in the next war, regimental bearers will not be able to act as such whilst the fighting is going on, but at the close of a great battle an immense work will devolve on the Army

Hospital Corps, which it cannot effectively meet unless assisted by a strong reserve of trained bearers.

In all grades of society we find a disposition to ignore the value of the medical profession until sickness or accident brings us into close and necessary contact with its members: we then are compelled to appreciate their value. If this be true in civil life, how much more so is it in the Army! Whilst no means are neglected which can bring the personnel and matériel of an army to the highest state of perfection, and field days and autumn manœuvres are regarded as the precursors of battles in which Officers and men will continue to add glory to the national flag, we are too much inclined to disregard the reverse of the medal, often as it has been presented to our notice. Undoubtedly the first object of a Commander is to win battles; but in what a position is a General placed, if, having won a battle, he is unable to advance owing to the multitude of wounded who impede his progress, and whom he cannot leave behind him without proper care! Whilst, on the other hand, if he move forward he requires his full complement of surgical and medical aid. It is, therefore, of the utmost importance that nothing should be left to chance; and if our Army is to be complete in all its parts, it is absolutely necessary that the ambulance arrangements for taking the field should be on an equal footing of excellence with the offensive means at its disposal; and, more than this, volunteer and supplementary aid should at all times be kept in touch with the official sanitary service, and there must be such an organization of the former in time of peace as will enable our Army, on the outbreak of war, to avail itself of this help, thus adding to its own strength and completeness without throwing out of gear or dislocating any part of the Civil Service of the country.

An important speech was recently delivered in the Austrian Delegations by Professor Billroth, on "Medical Services in the Field," of which a translation was published in the March number of the Journal of this Institution. In the same month an article on "The New Military Weapons and Explosives," by Sir Thomas Longmore, appeared in the "British Medical Journal;" and, still more recently, there was published in the same Journal an abstract from an address delivered at the Friedrich Wilhelm Institute in Berlin, "On the Surgical Relations of the New Projectile," by Professor von Bardeleben. These three documents, which have attracted much attention and have given rise to very serious thoughts, must surely lead those who are occupied with military subjects to ask themselves the question put by Dr. Billroth, "Are steps taken to improve the means of aid to the wounded in proportion to the increasing development of destructive agents?" One thing is evident, namely, that the system of collecting the wounded during an engagement will have to be completely changed. No bearer detachment could live for two minutes within the fighting line under the hail of projectiles which the new magazine rifles would now pour upon them, and this without the curtain of smoke which has hitherto, to some extent, veiled the movements of contending armies. The danger for the medical staff and bearer companies will

be far greater than that of the combatants, for whilst it is the duty of the latter to avail themselves of all the cover that can be obtained, the bearers have to move slowly and carefully with their burdens, and this generally in the open. My own impression is, though it is a thought one scarcely likes to utter, that in the next war the medical corps must leave the wounded where they fall, preparing meanwhile for the moment when the contour of the ground or the ebbing tide of battle may allow them to act. Under such circumstances, a wounded man would probably be safer whilst lying on the ground than if he were being carried off on a stretcher.

Sir Thomas Longmore tells us that "everything tends to show that, while the number of sufferers urgently requiring help will be vastly increased in future wars, the means of affording them shelter and surgical attention will be pushed back to a greater distance than has ever before been necessary." This compels us to consider how the present system of collecting wounded can be altered to meet the changed conditions. Professor Billroth puts the matter very forcibly as follows: "Now as to the greater length of trajectory of the new projectiles, you may say, What does that matter?—put the dressing stations a few hundred paces further back. If they were, say, 500 paces to the rear before, then they will be 700 or 800 paces to the rear now. Quite so. But for the bearers, who have to carry a heavy man weighing 18 or 19 stone with his kit, upon a stretcher, this increased distance means not only an immense increase of labour, but also makes the journeys much longer in point of time; consequently far fewer wounded can be transported from the battle-field to the dressing station in a given time. Just try this carrying for 500 paces or even 700 or 800 paces! It is no joke, and for any length of time absolutely impossible. Now you cannot set up a dressing station at the regulation distance from the corresponding army corps, &c., in the glare of the sun or in the rain. You must have some sort of cover for it, a house, a ditch, a patch of wood. Not that the surgeons are wanting in devotion in the enemy's presence, but what is to become of the wounded if the surgeons get shot? You may say that they are protected from this by the Geneva Convention. Yes, but what use is the Geneva Convention if your own side retreats towards the dressing station, or the enemy advances, and you find your dressing station in the firing line? This means shifting and hunting up a new place. No one can form a true idea of these difficulties who has not been through them himself."

The increased number of wounded, therefore, must entail a great increase in the number of bearers, which in our Service (the Austrian) is at present very small and insufficient. Yes, we must even come to the conclusion that, in future, it will no longer be possible to remove the wounded from the field by means of bearers, unless it is to go on for days together. Hence it will be necessary to place a great number of light carriages, even close behind the line of battle, for the purpose not only of transporting the wounded to the field hospitals, but also to get them away from the battle-field itself, provided that the ground admits of it."

Surgeon-General von Bardeleben, viewing the matter from a German point of view, says:—

"The first and most difficult task will be to remove without delay the enormous number of wounded out of the fire line. Who will be able to tell beforehand where bandaging places will be out of reach of the enemy's fire? Some urge an increase of sick-bearers and wagons for the removal of the wounded. This sounds very humane, but we must not forget that sick-bearers have to advance into the fire line and to expose themselves to the bullets. If we go on increasing their number shall we not also increase the number of wounded, not to mention other risks? Already the number of men provided for the transport of the wounded exceeds a battalion (1,000 men) for each army corps (24,000 men). Such demands are often inconsiderate and exaggerated. War is no humane institution. We surgeons are fully prepared to practise humanity as much as possible in war, but it must not be in such a manner that in order to effect an uncertain saving of one human life a larger number of lives of other men should be risked. The administration of the German Army has made great advances in increasing the number of men and wagons for the transport of the wounded since the experience of the wars of 1866 and 1870, and seems to have reached the limit to which, under existing conditions, it is possible to attain."

The questions I have thus briefly considered, as to the altered conditions of war which the progress of science has developed, have been so ably treated by the unimpeachable authorities to which I have just referred, that it would be presumptuous on my part to attempt to amplify the important statements they have made. But as one who has served as a volunteer ambulancer in more than one campaign, I would strongly insist on the advisability of giving every encouragement to those civilians who having been enrolled for ambulance purposes in time of peace are able and willing to supplement the Army Medical Service in time of war. Such assistance, to be of any value, must be prepared beforehand, or it will only lead to confusion at the critical moment, when responsible Officers will have little time at their disposal for the organization of a new system. The most recent European wars astonished the world by the magnitude of the battles, and the enormous proportion of wounded men who, in the course of a few hours, and sometimes in a few minutes, strained and overtaxed the resources of the medical staff. Knowing this, and knowing also what men like Longmore, Billroth, and Bardeleben have foreshadowed, and looking forward to the future, it would be a criminal act were we to ignore the teaching of experience, and refuse to make a practical endeavour to keep the means of alleviating the horrors of war in some degree near the level of the art of destruction. There are men who bear honoured names, and for whom personally I have the greatest respect, who in regard to all changes connected with the Army bring everything to the touchstone of the Crimean War or even the Peninsular Campaign. I will not venture to question their opinion, except on the one point of ambulance work and matériel. If they still believe that it is

unnecessary the medical corps of an army should be kept up to the exigencies of what is euphemistically called scientific warfare, then I am afraid I shall be charged with offences which are generally attributed to ignorance. There are others who think, and with whom I am much more inclined to agree, that the progress of science is tending to render war almost impossible, and that the engines of war having been made so terribly destructive, and fair fighting being a thing of the past, we shall have no more war, as no Government will dare to incur the responsibility of beginning one. Be this as it may, surely no nation could patiently accept such a conclusion as a certainty, or sit down with the reflection that "sufficient for the day is the evil thereof." War is not like an earthquake or other unforeseen natural phenomenon; it is a calamity which we are daily anticipating by striving to make ourselves stronger than our neighbours. *Si vis pacem para bellum.* Recognizing this, is it not an absolute duty to do our utmost to lessen the gravity of consequences which are inseparable from war, and to inculcate the exercise of such work as a civic virtue of the highest importance?

The conclusions to be deduced are as follows:—

1. That the possibility of war and even of a foreign invasion must be admitted, and it is the patriotic duty of civilians as well as soldiers to be duly prepared for it.

2. That behind the Army Medical Staff Corps and the Volunteer Medical Staff Corps there should be a reserve to meet eventualities which have been already foreseen by some of the Red Cross Societies of European States, with the sanction and encouragement of their respective Governments.

3. That no Medical Department of an army can be maintained during peace in a state fully equal to the demand which will be made upon it by a war of any magnitude. Were it otherwise, a vast expenditure of money would be required, and a large personnel must be kept in comparative idleness, in order to meet possible contingencies that the heads of armies do not in peace-time consider of the first importance.

4. That the requirements of peace need a large body of ambulancers to be always ready to deal with injuries caused by the accidents of civil life, and the sickness which is never absent from dense populations. That such a body of trained men and women exists, and it is only necessary they should be organized, and kept in touch with the Army, to prove themselves a valuable supplement to the Army Hospital Corps.

5. That in each of the military territorial divisions of Great Britain a corps of civilians trained to administer first aid by the St. John's Ambulance Association, and drilled sufficiently to enable them, if necessary, to be attached to an army, should be formed. That except in case of absolute necessity, such a corps should not be removed from its own district, but that it should be periodically inspected on its own ground by an Officer appointed by the War Office.

(Such a corps, in case of foreign war, might be relied on to take over all the Army hospital duties of its own district, and thus set

free for service abroad almost the whole strength of the Army Hospital Corps. Many of these civilians would also enrol themselves for ambulance service abroad if such help were needed.)

6. That the ambulance matériel used in civil life, and especially the wheeled transport matériel, should be made in such a pattern as to be equally useful for the necessities of war as well as of peace, and that all horse ambulance carriages, now or in future used throughout the country, which will take the Army Regulation stretcher, should be registered at the War Office as capable of employment for Army purposes at home.

7. That a local Ambulance Corps, under its own Medical Officers, should be formed at the principal ports of the kingdom, and that, in case of war abroad in which our own Army may be engaged, these corps should be ready to undertake the care of such sick and wounded men, when landed, as it might not be expedient or possible to remove to the military hospitals inland.

8. That such a scheme as is involved in the above conclusions would, if adopted, in no degree lessen the responsibility of the military authorities to maintain the Army Medical Staff and Medical Staff Corps on the same footing of efficiency and completeness as every other branch of the Service; and that the proposed personal and material reserve would greatly strengthen the Army Medical Department in time of war, and that at a comparatively small annual cost, provided the Government would guarantee that in case of the mobilization of any or the whole of the Corps, those enrolled should receive the same pay and reward as men serving in the Regular Army.

Sir VINCENT KENNETT BARRINGTON: I need hardly say that I agree in the main with Mr. Furley, but there are two or three points on which I disagree. The first is about improvised means of transport. Mr. Furley states that improvised means of ambulance transport is an expression which ought not to be allowed in the Service. But I consider it a subject of very great importance, and one which should be carefully studied both by the Army Medical Staff and all those engaged in Red Cross work. I have had about five years' service in war, including several European campaigns and a revolution or two in South America, and my experience has been that nine out of ten wounded men never see the inside of an ambulance wagon, properly so called. The great mass of the wounded after a battle are conveyed to the hospital in the rear in the empty wagons that have brought up provisions and shot and shell. I think, therefore, there ought to be a great deal of attention devoted towards improving these improvised means of transport. In the Servian and Russo-Turkish wars most of the wounded men were brought back in country carts. Happily many of the Surgeons were acquainted with the system introduced, I believe, by some Swedish Surgeons, of preparing country wagons by first placing a layer of fresh cut branches, and then above this one of smaller twigs, and upon these to place a mattress. An ox-wagon, with large wheels fitting the ruts in the road, can thus be converted into a fairly good conveyance for wounded, infinitely better than the most costly ambulance wagon, should the gauge of the latter's wheels not fit the ruts. In such a case, even with the most elaborate system of suspended stretchers and springs, the wounded men are liable to be shaken most fearfully. I have removed wounded from modern ambulance wagons, and placed them by preference in the bullock wagons furnished in the way mentioned. In the last Turco-Russian war two of our own English Army ambulance wagons were sent out, and ultimately handed over to the Egyptian Contingent; but they could

not use them, as they were too heavy, and the wheels did not fit the roads. They gave them to me, as I happened to be Chief Commissioner of the Stafford House Committee; but the only way we could utilize them was for bringing wounded men along a hard road from the Varna Railway Station to the town hospital. With regard to the necessity of different kinds of wagons for different circumstances which Mr. Furley has recommended, he is a great authority, and I accept his judgment, subject to the above remarks. In the Carlist War special ambulance wagons for smooth roads were constructed, drawn by five mules. Each wagon could contain twelve men lying down. I saw them working satisfactorily for two years. They were built in two stories, taking six men on each story. During hard frosts the best ambulance conveyances I have ever known were the sledges used in the Servo-Bulgarian War. With regard to cacolets, Mr. Furley does not seem to believe in them as much as I do. Mr. Furley was in the Carlist War for some time, but, if he had been there during the latter part of it, he would have seen splendid work done by cacolets. The great mass of wounded men requiring conveyance are wounded in the hand, and for such cacolet transport is a very good way of conveyance in a rough or mountainous country. I cannot speak as a Surgeon, but I am supported by Surgeons who had a long experience of gunshot wounds in the Carlist War. On one occasion I conveyed eight wounded men a distance of 12 miles in cacolets, on three mules, without any other assistance. The men did not suffer at all during the journey, nor was any injury done to their wounds. I admire these stretchers very much that Mr. Furley has shown us to-day, but I dislike a doubling up jointed stretcher in war, as any joint may get out of order. I should, as far as possible, avoid all such complications, and would rather have the simplest form possible. With regard to the effect of repeating rifles and smokeless powder on war, I remember a discussion which took place at Woolwich when the late Major Duncan and several Army Surgeons spoke on that subject. Opinions differed immensely as to what that effect would be. I believe that the total proportion of wounded men to combatants will not materially vary from now, because if you refer to the proportion of the number of wounded in war after the adoption of breech-loading instead of muzzle-loading rifles, you will find that the proportion has not become greater. In fact, they say that in the old days of the *arme blanche* a greater proportion of men were killed and wounded than is the case even now with the breech-loading rifle. There is one general question I should like to touch on, that is, the position of Red Cross Societies in relation to armies in the field. I do not think a Red Cross Society, especially in England, ought to bear the relation to the Army Medical Staff that the Volunteers do to the Army, as suggested by Mr. Furley. The Volunteer Medical Staff is a very efficient body, growing every day: that is the body to stand in the relation of Volunteers, supplemented, we all agree, by funds from the Red Cross Society. But I think the Red Cross Society in the field ought to have an organization far more elastic than the Army or Volunteer Medical Staff. I think their Commissioner ought to be in a position to move rapidly, to fill up gaps, and to do many things which cannot be so conveniently carried out by the Army Medical Staff. I have the honour of being a member of the Council of the National Aid Society, and I know by our constitution that our first object is for the aid of British sick and wounded soldiers in war; but, as a matter of fact, our society is called upon generally, I may say nearly always, for foreign wars, and although I quite acknowledge that our organization should enable us to assist in any war in which Englishmen are engaged, yet happily our English wars are generally small wars, and our Army Medical Staff are perfectly capable of doing everything that science, art, and experience can accomplish. I had the honour of being out in the second Suakin expedition, and saw the good work done by the Army Medical Staff. I consider that Red Cross Societies should largely avail themselves of the assistance of distinguished civilian Surgeons. In many foreign wars they came gratuitously, or only for their expenses, and brought with them young surgeons and nurses belonging to their respective hospitals. I do not believe myself that the tendency of Governments to delegate Red Cross operations to the rear is as strong as Mr. Furley pointed out. In recent wars our Red Cross Surgeons were largely engaged in the front. I do not like the system adopted by many foreign Red Cross Societies,

of forming large depôts of ambulance wagons and other matériel, much of which is sure to spoil or become obsolete, while a part of the Societies' income has to be devoted to maintaining such matériel. I think the Army Medical Department ought to supply all ambulance wagons required for our Army. I cannot sit down without expressing my great admiration of Mr. Furley's paper.

Inspector-General of Hospitals R. LAWSON: Mr. Furley is, I believe, quite aware that I differ from him in his opinion on several points, and I hope we shall agree to differ. With regard to his stretchers, the question of having telescopic handles was a subject that was frequently before us at the meetings of the Committee on ambulance equipment, but we could not find a handle of that description that would stand the work. Whether his stretcher that he has exhibited will, upon full experience, be found able to stand the work, I do not know. I like the look of it, but, like himself, I strongly object to adopt anything without having tested it fully. If his stretcher will stand the work, it will, no doubt, be a great improvement, because, as he has pointed out, in some of the present ambulance wagons the ends of the poles pass through the partition which separates the body from the *coupé*, and they are bound to be struck by people on the *coupé* to the inconvenience of the persons lying on them. Another inconvenience is that the handles projecting into the bottom *coupé*, which is supposed to contain three men, generally speaking, with wounds of the upper extremities, and those men passing out would have those poles, some 3 or 4 inches above their feet, to step over, with the risk of tripping and sustaining a severe fall. Another point with regard to the stretcher is this. We had a stretcher with a canvas bottom 6 feet 3 inches with a pillow at one end. With a stretcher of that length you will be able to accommodate most men with fractures of the thigh, lying upon them, without the foot touching against the partition at the end of the stretcher; but if you shorten it, you will, with a long man, render it absolutely impossible to carry him upon a stretcher with a fractured thigh or leg without taking out the partition and leaving part of the space unoccupied. There was another point that we recommended strongly with regard to the carriage of the stretcher, a most important point which seems to be systematically overlooked. In former days, when Sedan chairs were in use—I do not know that there are many persons except myself who really ever saw them—the carriers always had what they called "yoke slings," a sling with two straps passing one over each shoulder and united behind the back of the neck to a cross-piece, to prevent their coming off the shoulder. That is by far the easiest way of carrying weight. Instead of that, we now have the regulation sling with a broad leather strap attached to the stretcher, brought up in front of the shoulder and passed round the neck, so that the man has not only to carry the weight, but he has to make use of strong effort of the muscles in the back to prevent his falling forward. The substitution of the "yoke sling" for the one at present in use would cost very little. It would be a great advantage and much safer and easier for the men to carry. Mr. Furley has entered a special plea in favour of having wagons of different kinds for use in this country on smooth roads. That of course he is quite right to do, and so long as they are used for that purpose, well and good; but the moment you go into the field, you cannot depend upon having smooth roads, or indeed any roads at all, and then you must be prepared with something that will stand rough usage. He has alluded to the possibility of bearers being able to carry the sick from the field up to where the wagons are waiting, without taking the wagon off the main road. I have not had an opportunity of looking into that in the open country, but I have examined the plan of a piece of country on a very large scale—about 10 feet to the mile—round the model of Waterloo up-stairs. I examined the field of action there to see whether there were any roads that could have been used. There were some, but very few would have met his views; so that upon that point we must depend more upon wagons and less upon bearers. With regard to wagons, the question is, how many people they could carry. There were the two prize wagons at Paris in 1867 brought before the Committee. Those wagons were adapted to carry six persons only, and we were told that they were lighter and far superior to ours in every respect. When they came over, I weighed them to see what they were, and I found of the three English wagons that had been described as totally unfit for service, clumsy,

heavy wagons, the heaviest was a hundredweight lighter than the lightest of these prize wagons. When I asked the person who came with them what weight the wagon was, he said, "1,300 lbs." I said at once, "Much closer upon 2,000 lbs."—that was the fact. They carried six persons in them, whereas our wagon was adapted for eight persons, two recumbent in the centre, and six sitting. Of course they might not be able to carry the total number; they might be sometimes obliged to take one more, but the important question arises here, to which Mr. Furley has alluded, that is, that if you had a wagon adapted with springs to carry eight people, that wagon, unless it had the full weight of persons or material in it, would be most uncomfortable to ride in, supposing there were only two or three people. I myself rode in such a wagon at the Cape, going through the country upon what was called smooth ground. I was sometimes obliged to sit in the wagon and hold on to the sides with each hand to prevent my head being knocked to pieces against the bars of the roof. That is going over smooth roads. Had there been the full weight in the wagon, it would have been very different. You cannot get a wagon that will carry ten persons, having springs adapted to that number, that will carry two persons only without making it very uncomfortable for the latter. On the contrary, if you put ten persons in a wagon with lighter springs, they would be so heavy that the springs would be no use at all. They meet that practically in this way, that while the spring is so arranged as to carry four or five persons without difficulty, they have what they call a check spring, a strong spring which only comes into operation when the wagon is coming down upon it. That is an expedient, and so far it is a useful expedient without which you could not get on. There are several other points I should have desired to notice, but, the ten minutes allowed each member for discussion having elapsed, I must make way for others.

Surgeon-Major W. S. PRATT: As a humble member of the War Office Medical Staff I should like, with your permission, to say a few words. And, first, with regard to the alterations and improvements that Mr. Furley suggests in ambulance wagons and stretchers. The great thing that we have to contend with is the Treasury. As long as we have a large stock of serviceable equipment in hand they naturally will not sanction anything further. At the same time I must say I will stick up for our own stretcher, and a good deal for our own ambulance wagon. You have to look at the men who handle these things. The skilled civilian bearer is careful enough, but Tommy Atkins and the young recruit do not understand these ingenious and complicated matters. And as to this beautiful stretcher that we see in front of us, if it only jams, he is apt to kick it into shape and to put it out of gear altogether. I think that thing would break down. With regard to the ambulance, Mr. Furley says he would like to see it carrying only sick and wounded, no goods nor gear of any kind. All our ambulance wagons are calculated for fighting in foreign countries, mostly savage countries. There are no railroads, and the best wagon we have now, devised by General Buller, weighs 18 cwt.; tonnage 11·08 tons. I do not thing any General Officer going through a savage country would like to have a lot of light ambulance wagons taking up the horses and carrying only wounded men, and to give up those wagons that might be utilized for carrying heavy stores when they are not required for carrying the sick. I do not think he would be content to exchange those for very light ambulance wagons carrying nothing but wounded men. With regard to home defence and the elaborate arrangements as to railways and so on, it must be remembered that we are not like foreign countries with hostile foes on our frontiers, who are liable to cross the frontier at any moment and be in our country. We have the sea all round us, and before an army could invade England it would require that our Fleet should be swept off the seas. You can hardly imagine 150,000 men landing in England whilst our Fleet is in existence. If our Fleet is destroyed, there is only three or four months' food in England, and therefore it would become a question of surrender or starvation. If the enemy did land, the only thing they could do would be to make a dash on London. If that were to fail, hardly a man of them would get away. In such a case the whole resources of the country would be at our disposal—ambulances, hospitals, and everything else, and the whole fighting must be over in a brief period. With regard to arrangements made for it, there are at

present drawn up and in the possession of the authorities elaborate schemes for the reception of a very large number of wounded in London as a base hospital. Those wounded men could be cared for and nursed at once, but I do not think that all the elaborate arrangements of hospital trains, field hospitals, &c., suggested by Mr. Furley would be necessary, because if an invasion of England did take place, and if anything did occur, it must necessarily be decided in a very few days. With regard to the tents and these very elaborate and beautiful bar arrangements, they are capital things for civilians to use, but I do not think they would do, as far as I can make out, for very rough work in the hands of young soldiers. We have learnt by experience the evils of over-elaboration in our pharmacy wagons, which have been marvels of packing, but I do not think they could ever be used on active service. They are so beautifully packed that, when they are unpacked, I do not think there are four men in England who could put them together again. With regard to civilian Aid Societies, I had very good experience of them in the Franco-German War. I was present at Gravelotte and at the fighting round Metz, and I am more than ever of opinion that isolated bodies of Aid Societies are practically useless and should not be allowed. Whatever material and assistance could be given should be under the control of the Army Medical Department, and should not be allowed independent action. With regard to carrying the wounded from the fighting line to the rear, some years ago our men were finer men than they are now, as their height has been reduced to 5 feet 3 inches to 5 feet 5 inches. The new rifle has rendered necessary an increase of the distance from the fighting line to the dressing station, which will now be about 2,000 yards in the rear. Now I think it will be impossible for men of such slight physique to carry wounded men such a distance steadily and comfortably for even one journey, and they will be required to make several journeys, and I am afraid much suffering may be entailed upon sick and wounded by this decrease in the physique and bodily strength of the Army Medical Staff.

Mr. ARCHIBALD FORBES: Like my friend Mr. Furley, I am here as a layman, but he and I have had a good deal of service together among wounded men on battle-fields from time to time. My own experience covers the battle-fields of three continents, and some ten years of my life were spent mostly in caring for wounded men, either in relieving them as they lay, or in helping to carry them from under fire. It is because of this experience that I have ventured to intrude into this discussion with a few remarks. I was much amused by the observations made by Sir Vincent Barrington, when he spoke of the Egyptian Division in the Russo-Turkish War as rather scorning the ambulance wagons which he offered it. I can easily understand this, because I do not think that during that war any member of the Egyptian Division ever had any need for an ambulance wagon (except indeed, possibly, because of syncope from fright), since no man of that force ever waited to be wounded, having run away in advance of that period of a fight when wounds are being served out. He spoke also of cacolets having been of service during the Servian War, for the conveyance of men who were wounded in the hand. The usual treatment of Servians wounded in the hand in that war was to kick them into space with all possible energy, because of the certainty that the wound to the hand was invariably inflicted intentionally by the man himself, and, therefore, he was not entitled to a cacolet or any other conveyance.

Sir VINCENT BARRINGTON: I mentioned the Carlist War, not the Servian War.

Mr. ARCHIBALD FORBES: I also listened to Mr. Furley with a certain sentiment of pathos, because it seemed to me that whilst he was talking, and talking very nicely, about stretchers with telescopic handles, and drawing fine distinctions between patterns of ambulances of infinitesimal shades of difference, he did not in the least give indication that he realized the probability of what it seems to me will be a likely occurrence in the next war—which I hope he will not live to see, for surely none of us want to see another war—namely, that, probably, about the second evening after the battle, if he should be on the field, he will probably find a wounded Brigadier-General competing eagerly for the ninth share of a country dung cart for his conveyance to the field hospital. I regard that as no strained illustration of the state of things that will exist in the future after a great battle, in

consequence of the immense number of wounded which the altered conditions of military armament will bring about. It may be, however, that Surgeon-General Bardeleben, of the German Army, is right, when he anticipates that there will be no wounded any more, and in his cheerful conviction that the new missiles will kill everybody outright. In that case, *cadet questio*, there is no more to be said; Mr. Furley himself will be disestablished; there will be no more occasion for any Medical Staff Corps, and the stretcher companies will find their occupation gone, and will have to content themselves with serving as burial parties. Personally, I venture to think that the battle of the future will not be so thorough in its destructiveness. My own idea is that, while the mortality will undoubtedly be greatly heavier, the number of wounded, both actually and proportionately, will be increased to an unprecedented and most ghastly and overwhelming extent; and that there will be no possibility of overtaking the work of prompt attention to them by any method or methods whatsoever. Since the attempt to remove wounded men from and behind the fighting line within range of fire would result in the wreck of the bearer organization in the first battle of the campaign of the future, no alternative can be hoped for, but that the wounded of both sides will have to lie where they are struck down till the battle is over. What will be the result of that? The vanquished will depart. He must leave his wounded on the field, for the simple reason that he cannot take them away. They will pass then into the possession of the victor. He will have his own wounded on his hands, and he will have also on his hands the wounded of the vanquished who has gone away. This, in itself, is no new thing; it has, indeed, been a practice of war ever since the beginning of that strange anomaly and contradiction in terms which we choose to call "civilized warfare." But the conqueror of the future, if he accepts the conventional burden, will become its victim. He will not accept it. He is in the field not to be a hospital nurse, but to follow up his advantage by hammering on the enemy, who has walked away jauntily, leaving his wounded behind him, and who may come back again to-morrow to strike him while clogged in the live and dead *débris* of the yesterday's battle. Do you imagine for one moment that the victor, in such circumstances, will think twice even about his own wounded, let alone the wounded on the other side? No; he will march away to overtake the vanquished, and will leave the wounded of both sides to the ministrations of Mr. Furley and his fellow-philanthropists of all countries, to whom it is hoped—although the hope is chequered by misgiving—that facilities for being available, in such an emergency, will be afforded by the belligerents. That is what, as regards the wounded, I believe will be the future of the next great campaign. It seems a very disheartening prospect: yet there may be features of it tending to mitigate its gloom. I venture to think, for instance, that the enforced remaining of the wounded on the battle-field until the battle is over, and for hours, and even for a subsequent indefinite period, notwithstanding the sufferings such delays must inevitably entail, will not produce consequences so calamitous as may be not unnaturally apprehended by those who "sit at home at ease." I believe, and I speak out of my own personal experience, that the severely wounded man, under the existing system of prompt removal to the dressing station, does not uniformly benefit by the hustling his removal inevitably entails, while he is suffering from the first shock of being wounded. I think that, in many cases, it would be wiser and better to leave him to "stew in his own juice" on the field, for a few hours, until he congeals—till he ceases to bleed. Of course he may have bled to death in the interim, if no ministration has been afforded him where he lies; but if he has got plugged up, and is in fairly good case, I think that he can lie without serious detriment—perhaps, indeed, with actual advantage, even for so long a period as twenty-four hours. Most all men conversant with war know instances of extraordinary tenacity of life in wounded men who had received no attention. Segur's story of the man wounded at Borodino having been found alive by the army retreating from Moscow has been somewhat discredited. But my comrade and myself found, on the fifth day after the battle of Sedan, a wounded man walking about in a sequestered part of the field, not, indeed, with sprightliness, but without evidencing great debility. His lower jaw had been shot away, yet he was still alive, in spite of this ghastly wound untended for five days—a wound, too, which precluded him from eating solid food.

I found also, on the third day after the battle of the 30th November, on the east side of Paris, in weather so bitter that sentries were actually frozen to death at their posts, a little nest of three wounded men lying, fairly snug, in a little hollow, not starved to death, not frozen to death, pretty hungry, but quite alive, and, as far as I know, they are alive still. And I make bold to aver that such men as Mr. Furley, and I should even say the President of this meeting, as a type of the military branch of the medical profession, are responsible, to my thinking, for doing the wounded soldier of the period—the contemporary soldier of all nationalities—a considerable deal of harm. He is coddled, now-a-days, to the extent that he really is deteriorated by over-tenderness of treatment. He has an anæsthetic administered when the top joint of his little finger is being taken off; he has hypodermic injections when he has a twitch of pain; he is treated with champagne, with all sorts of delicate extras, and everything that can make a man reluctant to own to convalescence. In the old days of the Peninsula and the Crimea, men had natures of more pith, and yet did not seem to die in much greater proportion than now-a-days, although they were entire strangers to all this demoralizing excess of dry-nursing. It is probably in the memory of most of you, that the late Sir George Napier was shot down in the breach at Ciudad Rodrigo while heading the storming party. He was made a football of for about a quarter of an hour, while the column passed over him as he lay. He was picked up with his arm smashed. Lord March tied a sash round it, and bade him go and find the amputating place. He spent about an hour in the search, and then sat down at the end of a *queue* of men to wait for his turn, which came two hours later. Then there was a dispute between the surgeons on a point of etiquette. Napier had asked his own regimental surgeon if he was wounded to do the needful; but there was a superior surgeon present, in the well-known Guthrie, who asserted his right to amputate Napier's arm, and the regimental surgeon had to give way. The operation took twenty-five minutes, Guthrie's instruments being blunted by much use. During that period Napier cursed Guthrie by all his gods. The arm was bandaged up, and he was told to go away and find quarters. He walked about in this quest for a great part of the night, when he found a house at last, in which a considerable number of other wounded Officers had gathered, and he remained there, sitting by the fireside, with his stump taking its chance, for a considerable time longer, until the death of the Chairman's namesake—the gallant General Crawfurd, of the Light Division—left a bed vacant for Napier. At Redintra, Napier, then a Captain, was again wounded—all the Napiers were always getting wounded—and he was carried back 7 miles to the rear. In the evening there arrived a soldier of his company, who had been searching for his Officer for several hours. Napier said to him: "I am very glad to see you; but, John, you are wounded yourself; your arm is in a sling." "Arrah, your honour," replied the stout soldier; "sure its nothing to spake about—only me arrum cut off below the elbow, just before I started to look for your honour!" There is the kind of man for you, if you like; not the shambling creature, of whom you have too much now, whom you dose with cocaine and chloroform, and pamper with port wine and preserved delicacies. I think, perhaps, that even under the future conditions of the fighting, even when the field is being swept by fire, so that bearers could not live, it may be possible to do something for the worst wounded as they lie—I mean those who are lapsing into syncope, either from loss of blood or from shock. Doctors are too precious for such a service; but there might be attached to every company a couple of specially trained Medical Staff men—a sergeant and corporal—supplied with simple things in a wallet, who should move about among the wounded as they go down. They would be no more exposed in this service than if they were in the ranks, and their duties would be, of necessity, uncomplicated—simply to take concern with the gravely wounded—administering here a tot of brandy, there applying a bandage. It is astonishing what simple appliances are often effectual. In the Kyber Pass I once adjusted a tight bandage on the wound of a man shot through the thigh, obtaining the compression by clapping a round stone in each orifice under the bandage, and at the end of a 20 miles rough journey in a dhooly, he had not lost a drop of blood. I think the next campaign will see the last of the existing bearer organization, now in the German Army amounting to 1,000 men to each army corps. An army of six

corps would then receive an accession of a brigade of fighting men, and what a comfort that will be to the General instead of 6,000 bearers, whose organization would be wrecked in the first battle. It seems to me that, apart from their inevitable destruction, bearers can the more easily be dispensed with in the future, since the battles will probably be shorter than in the past; and that immediately a battle is ended, reserves, which will not have been engaged, will generally be available for the mere mechanical duty of picking up the wounded and conveying them to the dressing stations.

The CHAIRMAN: I would ask you to let me say two or three words. In the first place, with regard to the paper generally, I think we are very much indebted to Mr. Furley for the extreme pains he has taken to put on record his views, many of which are not only practical, but very important. It is also very satisfactory, I think, to this Institution to be able to command the services of such a gentleman as Mr. Furley, who writes papers that are worthy of its Journal, and those papers go out to the Services generally, and from them we derive great advantage. I beg to propose that you thank Mr. Furley for the great pains he has taken in drawing up this paper, and reading it to us; and in doing so to thank those gentlemen who, like Mr. Forbes, have given us reasons for supposing that in future wars we shall not have, perhaps, so many wounded, but a great many more killed, and therefore doctors will have less to do. My own impression is that in future you will find public opinion so strong that unless the medical department, and the other departments entrusted with the charge of sick and wounded, are quite capable of taking care of them, and of bringing them early under treatment, the public will be down pretty heavily upon that department. I know in the late Egyptian campaign, a quarter of an hour was held to be the extreme length of time for the wounded man to be on the field without getting relieved. What will it be when you have thousands, instead of a few hundred soldiers to deal with? I will ask you to thank Mr. Furley for the very able paper that he has read to us, and in giving this vote of thanks, I will also give him an opportunity of replying to anything that has been said during the discussion.

Mr. FURLEY: The hour is so late that I do not propose to make any detailed reply. I can only congratulate myself that my paper has led to such a very interesting discussion. I think I have been misunderstood on two or three points. My friend Sir Vincent Barrington referred to the cacolet, and the use it is in the Alps. If he looks at my paper he will find that in my objections to it I particularly excepted mountains. Cacolets are, unfortunately, still necessary in mountainous countries. Then, again, with regard to the folding stretcher. I do not myself approve of such stretchers if the ordinary stretcher can be used, but when distinguished Officers at the War Office say they must have such things, it is a pleasure to me to try and meet the want, and therefore I have tried for a long time to produce a good folding stretcher. If Sir Vincent will refer to my paper, I think he will admit that he also quite misunderstood my remarks on improvised matériel.

Friday, July 1, 1892.

LIEUT.-GENERAL E. H. CLIVE, Governor Royal Military College, Sandhurst, Member of Council, in the Chair.

THE FRENCH MANŒUVRES OF 1891.

By Major G. F. R. HENDERSON, York and Lancaster Regiment (Instructor in Tactics, Military Administration and Law, Royal Military College, Sandhurst).

THE French Autumn Manœuvres of 1891 are undoubtedly to be reckoned amongst the more important military incidents of late years. Four corps d'armée and two cavalry divisions took part in them; and although I believe even larger bodies have been assembled in Russia for a similar purpose, this was the first occasion on which so large a force has been brought together in peace-time, and all Europe granted leave to judge for itself the efficiency of the troops for war. Still greater interest attached to the occasion, since it was the first appearance of a French Army, properly constituted, since the dark days of 1870 and 1871, and I think it was generally felt that a fair opportunity was offered of comparing the soldiers of the Republic with their ill-fated predecessors under the Empire. I have never ceased to congratulate myself that I had the good fortune to be able to attend the manœuvres, although in an unofficial capacity. Not only was there a good deal of dramatic interest attending the great gathering with which the French Government marked the coming of age of the Republic; not only was the spectacle, favoured by glorious weather and with magnificent country for its theatre, brilliant in the extreme, but no soldier can see 110,000 troops marching and manœuvring for several days in succession without enlarging his ideas and acquiring much useful information. Nor was there the slightest difficulty made as to spectators seeing everything that was to be seen. Everything was perfectly open and above-board; our small party of six English Officers was permitted to move about wherever we pleased; and all ranks of the Army, from the Generals downwards, were most courteous in answering questions and giving information. Moving thus freely over the field, standing alongside the batteries in action, going forward with the firing line, accompanying the regiments on the march, and talking to the Officers on picquet, we had a most excellent opportunity of studying practical tactics, and also of obtaining an insight into the interior working of the units, the

discipline, the endurance, and the mobility of the troops, and also into the relations between Officers and men.

It is because we had this opportunity, that I think the impressions made on English regimental Officers by the work and appearance of the French Army may prove interesting to some of you. We inspected the troops so thoroughly, that, despite our lack of experience, I do not believe that we carried away many erroneous ideas.

I have no intention of comparing the French Army with our own or any other; even were I competent to do so, I doubt whether such comparison would serve a useful purpose. Still I shall not confine myself strictly to describing what I saw. There is a comparison which may be fairly made—one which, to my mind, is of equal interest and importance—and that is, a comparison between the French Army of to-day and that which we knew long ago—the Army which lost all but its honour in the autumn of 1870. The constitution and the faults of that Army have been very thoroughly exposed. Every student of war, soldier or civilian, knows them by heart, and I ask you to recall the Army of 1870 when I describe what I saw in 1891.

My experience has been, in discussing the Republican troops with both soldiers and civilians, that many have forgotten that twenty-one years have elapsed since Paris fell, and that very few have paid attention to the great changes in organization and in training which have been made in the military system of France. It is surprising how few men you find who realize that while the old Imperial Army was a professional Army, composed of men who, however gallant they may have been, were certainly not men of high class, the Army of to-day is the nation in arms, recruited from every grade of society, and with thousands who boast the best blood and the oldest names in France serving as privates in the ranks.

Universal service, very strictly enforced, and the abolition of the system of substitutes, has entirely changed the character of the rank and file, raising the average of intelligence, and promising a stricter sense of discipline and duty than existed in 1870.

The country handed over to the troops from the 3rd to the 18th of September is that district of Champagne which is watered by the Aube, the Marne, and the Seine, a district already famous in the annals of war, and containing within its boundaries the military school where Napoleon was educated, and many of the battle-fields of 1814. The tract actually occupied is in the shape of a triangle, of which Vitry-le-François, to the north, is the apex, and a line running from Troyes to Chaumont the base. The distance from Vitry to Troyes and Chaumont is, roughly speaking, about 60 miles, and from Troyes to Chaumont the same, the area of operations containing 3,600 square miles, a tract a good deal larger than the county of Kent. This country is admirably adapted for manœuvres, the most striking feature being the great rolling downs, the great forests, and the magnificent roads. With the exception of Troyes, there is no considerable town; the ground is undulating, with neither natural nor artificial obstacles to the free movement of all arms, and everywhere

two most important military requisites are to be obtained—wide view and long range. The cavalry and artillery are as well served as the infantry, and no better theatre for the movements of large bodies could be imagined. The only objection is the want of water; brooks and wells are few and far between, and the drainage of the country appears to be confined to the rivers. The soil does not admit of much cultivation, and even the vineyards are by no means numerous. As usual in France and Germany, there are few walls or hedges except immediately round the farms and villages, and these are at wide intervals. As regards minor tactics, therefore, the ground was too open to give much scope for adroit skirmishing or skilful handling of small bodies of troops, but the long ridges, the deep valleys, and the extensive forests enabled the commanding Generals to find plenty of cover for their masses, either when approaching the enemy or when defending a position.

The manœuvres proper commenced on the 3rd of September, but the reservists were called in and joined on the 1st, and many of the regiments had been marching for several days before they reached the seat of war.

The corps engaged were the 5th, 6th, 7th, and 8th, of which the three latter are permanently quartered on the border, and constitute the frontier guard of France. The two divisions of cavalry, the 1st and 5th, were each composed of three brigades of two regiments, one of cuirassiers, one of dragoons, and one of light cavalry, hussars or chasseurs. To each cavalry division were attached three batteries, and to each corps d'armée no less than twenty, that is 120 guns on a war footing, six being assigned to each division. There is here a remarkable increase since 1870. In that year the French corps d'armée took the field with twelve field batteries instead of twenty, as now, and each division with but two field batteries and one mitrailleuse instead of six field batteries.

To each corps d'armée was attached a light cavalry brigade of two regiments.

Another peculiarity of organization were the two provisional brigades, one of chasseurs-à-pied, and another of marines. Of chasseurs, or rifles, as I may call them, there were seven battalions, brigaded together, and of marine infantry the same. There were also three marine field batteries.

Of the strength of the various units it is not necessary to say much.

The infantry battalions seldom numbered more than 600 bayonets; the cavalry about 100 horses per squadron; and the batteries each four guns and three wagons, with the exception of the horse and marine batteries, which had a full complement. An interesting point is the number of the reservists. Of course it was impossible to detect from personal observation how many of these were in the ranks, but I gather from various sources that, on an average, there were about 200 per battalion.

The marine reservists had also been called up, and their battalions were rather stronger than those of the line.

The course the manœuvres took was as follows:—

The 5th Corps d'Armée, concentrating about St. Rémy to the south, manœuvred against the 6th Corps, concentrating at Vitry, 30 miles to the north-east. On the 2nd of September the reservists arrived; on the 3rd the troops moved forward, and on the 4th the two forces fought an action at Aulnay, on the Voire, some 20 miles distant from the localities of concentration.

On the same date the 7th and 8th Corps met at Mont Saon, near Chaumont.

On the following day, the 5th of September, the 5th and 6th Corps joined hands, and passed under the command of General de Galliffet, in order to manœuvre as an army against the 7th and 8th, who had united under General Davout, and the Headquarter Staff, General de Saussier and his Chief of the Staff, General de Miribel, took over the supervision of the operations. The two armies moved forward on the 5th, each marching some 30 miles, and after a cavalry fight on the 5th, and a day of rest on Sunday, the 6th, met in battle at Colombey-les-deux Églises on the 7th.

On the 8th General de Gallifet, re-crossing the Aube, was pursued by General Davout, and on the 9th was fought the action of Vendeuvre, at which M. de Freycinet, Minister of War, and the foreign Military Attachés were present.

This action ended the second period of the manœuvres. On the 11th, after a day of rest, the two armies combined, under the command of General de Saussier, moved against a masked enemy, composed of the provisional brigades of chasseurs and marines, 14 battalions, 9 batteries, and 12 squadrons.

The night of the 12th saw the passage of the Voire; and on the following day, the 13th, the four corps moved in a north-westerly direction, disposed in square, so as to be ready to meet attack either in front or flank. On the 14th the marked army was defeated at Margerie-Hancourt. On the 15th the pursuit was taken up, and the troops reached the vicinity of Vitry, where, after a day of rest on the 16th, the manœuvres terminated on the 17th by a march past of the whole force before the President of the Republic. This programme, starting from September the 3rd, of 14 days' work gives 12 days of marching and fighting to 3 days' rest and 1 day for the march past. The 6th Corps, which originally concentrated at Vitry, returned thither for the final review, having traversed in the 12 working days about 110 miles, and been engaged in five actions.

As to the strategy of the manœuvres little need be said. The general ideas were issued with the object of bringing the opposing forces into contact on pre-determined battle-fields, and not one of the Generals had any opportunity of displaying his skill in manœuvres outside the battle-field. There is no doubt that this circumstance deprived the operations of much of their interest, and the War Ministry has been severely criticized, in France as elsewhere, for thus tying the hands of the leaders, and confining their efforts to the handling of their troops in action. But it must be remembered, first, that the assembling of 100,000 men was an experiment; secondly,

that Champagne is a poor country, lacking in both supplies and quarters; and, thirdly, that the object of the manœuvres was to test the capacity of the Staff in handling masses of men under normal conditions.

The question of supply, moreover, grows in importance and in difficulty in proportion to the number of troops engaged, and side by side marches the question of expense. In the first place, it may be noted that the ordinary railway traffic in the district was not interfered with during the manœuvres; secondly, that long notice was required to enable the village authorities to accumulate the supplies that were requisitioned; and, thirdly, that the sum voted for the annual manœuvres amounted to 230,000*l.* sterling.

At the same time, the existence of a programme, worked out long beforehand down to the minutest detail, and known to all engaged, not only deprives us of an opportunity of determining the strategical skill of the Generals, but of judging the real efficiency of the Staff, and it must be borne in mind, however remarkable the smooth working of the latter may have appeared, that it was not very highly tried. On the field of battle the restrictions of the programme were less felt. The Generals had indeed little choice of positions, and little latitude as to lines of attack, but this is a disadvantage which is conspicuous by its presence in actual warfare. A General is more often called upon to show his skill in making the best of a bad position than in selecting a good one, in attacking a strong line than in finding out a weak point. The grand tactics, therefore, of the manœuvres, comparatively unfettered as they were, can hardly fail to be of interest, and I will try and put them before you from a general point of view.

To begin with the process of taking up contact. Here there was no departure from normal procedure. When corps moved against corps both were screened by their cavalry brigades; when army moved against army the cavalry divisions led the advance; but, as regards the working of the screen, the short distance apart at which the opposing forces started, never more than 40 miles; the exact knowledge of the enemy's point of concentration, his line of advance, and the locality of the engagement that must ensue, undoubtedly robbed the cavalry of much instruction, and were by no means productive of an excess of zeal or interest. Still the work was done on the usual lines. Officers' patrols scoured the roads, and the brigades or divisions always came together in orthodox fashion during the day preceding the general engagement. The infantry and artillery, meanwhile, covered by strong advanced guards with batteries well to the front, occupied their assigned cantonments, and the cavalry drew off to the flanks, leaving the scouting between the opposing lines to be done by the divisional cavalry or infantry patrols. But when once the troops were in position, although invisible to each other, there was very little of this kind of work done; and, except from an instructional point of view, it was unnecessary. There was no further information to be gained. The battles, as a rule, began with a prolonged artillery engagement, often at rather long ranges,

between 3,500 and 4,500 yards. The artillery, without special escort, was employed in masses, wherever the ground permitted in two tiers, and came into action by groups of three batteries. While this preliminary was taking place, the infantry was deploying for action under cover of the woods and undulations. This deployment was a long process, much attention and supervision being given to the ordering of the successive lines before they were permitted to advance, and until all was ready for their movement, the front was covered by strong points in the intervals of the artillery being held by the *chasseurs-à-pied*, and the battalions of the advanced guards. During this stage, the engagement was usually confined to the artillery; there was little skirmishing, both sides appearing to rely on the rapid and impetuous attack of a large mass drawn up at the outset in good order, and to discourage minor enterprises against the outlying posts of the defence. The destruction or driving in of such posts was generally left to the artillery.

I here speak of both sides, for very often both sides assumed the offensive, the next stage of the battle being an almost simultaneous advance of two of the opposing wings. This double attack was a curious feature, and indicates, I venture to think, that the mainspring of the French tactics of to-day is the offensive, a very different idea to that which prevailed in 1870. Of course, in such a proceeding, one side, favoured either by the ground or by deploying more rapidly, seized the initiative, and threw its opponents on the defensive. But even under these circumstances the doctrine that safety lies in attack soon asserted itself, and whenever the assailants' advance was checked a strong counter-attack was made by the wing hitherto unengaged, this movement being made with the same order, precision, and strength as that which initiated the battle. During the infantry fighting, the cavalry brigades worked with their own corps, a very short distance in rear of the fighting line, whilst the divisions manœuvred against each other on the wings, or as at Vendeuvre, the most important battle, charged the flank of the advancing infantry.

The engagements began about 8 o'clock in the morning, and the cease fire was ordered by the Umpire-in-Chief when the infantry had come into close contact all along the line, generally about 1 o'clock. Such were the main features of the grand tactics. First, the concentration of the cavalry divisions forming the screen; secondly, the employment of the artillery in masses; thirdly, the energetic attack of a large mass, moving in a body against the tactical objective; and, fourthly, the constant tendency to assume the offensive.

I may notice that this tendency is likely to prevent one of the commonest faults committed by the Generals in 1870, that of submitting to the attack of an unsupported advanced guard, without making the slightest attempt to destroy their audacious antagonist. Over and over again I noticed constant endeavours to test the strength of the enemy's advanced guard, which, had there been no supports at hand, would undoubtedly have been converted into energetic attacks.

I will now speak of each arm in detail, and here I shall make free

use of the letters written to the "Times," by their correspondent at the manœuvres.

First, the artillery. I have already spoken of the large number of batteries attached to each corps d'armée, thirty-six more guns than in our own organization, and for a long time it has been well known that this powerful arm has reached a high state of efficiency in France. It is well horsed, manœuvres with precision, if not with rapidity, is well officered, and the men are of superior physique to the rest of the army.

To its employment in masses and in two tiers, wherever possible, I have already alluded, and, so far as I could see, the positions were generally judiciously chosen. In the engagement against the marked enemy, General de Saussier deployed forty batteries, representing, had each battery been equipped at war strength, 240 guns, in a single line between his two armies, and at Vendeuvre I counted twenty batteries in mass on General de Galliffet's left. That there were mistakes made in selecting positions goes without saying, but the instances that came under my notice were rare, and it was impossible not to notice the order, regularity, quiet working, and good drill everywhere visible. The batteries were each accompanied by three wagons, and each group of three by a fighting train. The fire discipline was good, and care was given to the laying, but, as has been said elsewhere by an English critic, the concentration of a large number of guns on a single target does not appear to be considered essential. However, this is a point on which it is very difficult to generalize; circumstances may sometimes compel an artillery Commander to assign to individual batteries targets which are far apart; moreover, I have never seen this question of concentration thoroughly discussed, and I think many Officers who are not gunners have somewhat vague ideas respecting it. For instance, when artillery is firing on a line of infantry advancing, it would scarcely be judicious, even were it feasible, for every gun in a long line of batteries to direct its fire on a single battalion. The battalion so favoured would possibly suffer, but the remainder would escape, and perhaps reach cover before their time came to play the part of target. There was one thing to be remarked concerning the taking up of position, and this is that the French disregard cover in favour of precision and steadiness. The batteries, even when unlimbering on ground already under fire, did so without the least attempt at hurry, and very often the teams and limbers were kept close in rear of the guns on open ground, notwithstanding the fact that there was cover to be found a few paces further back. Nor did I notice or hear of a single case in which guns were kept behind the crest and run up by hand; perhaps the weight of the piece may have something to do with this, but my impression is that this precaution is considered useless when batteries are employed in mass. They rely for protection rather on their own fire than on expedients which can seldom be more than partially applied.

The positions of the groups of batteries are always selected by the artillery leaders, and it is scarcely remarkable that the presence of three or four mounted Officers on any favourable spot should always

have warned the opposing infantry of what was to come. Even private soldiers were quite up to this proceeding, and directly the little group of Officers appeared one heard a murmur go down the ranks.

Smokeless powder, which was used for the second year in succession at the manœuvres, has brought about tactical developments of which the French have taken full advantage. Guns, especially when the batteries are posted on high ground, can fire over the heads of their own infantry, even if it is attacking, when it is almost at close quarters with the enemy; there is nothing to mask their fire; and again, when they have found the range, there is no need for them to change position, except to give the infantry moral support. On the defensive, the French gunners had this question of moral support well in view, and on several occasions I saw them holding their ground, when their own infantry were falling back, until the assailants had got within 1,200 yards. When necessary, also, that is, when the ground masked the objective, they showed no hesitation in pushing forward to close range.

Naturally, as an infantry Officer, with little more than theoretical knowledge of the other arms, I speak with diffidence on the question of artillery. I can only describe what I saw myself, and it is possible that many faults were committed which escaped my notice; but, for all that, when we recall how infinitely inferior the artillery of 1870, both in tactics and matériel, was to the Prussian artillery, we cannot fail to realize the enormous strides that have been made in both directions by the French artillerists since that date. How bad the artillery of 1870 was very many people have not yet realized; how good are the batteries of 1892 only the test of war will reveal, but we may be sure that the balance will be far more even.

Smokeless powder, as used by masses of artillery, does not do much to render the guns less visible. There are always bright, white flakes of flame which immediately attract attention, and on dry soil the cloud of dust driven up by the explosion is always seen from a long distance. It is more difficult, perhaps, than heretofore to count the number of batteries in opposition, but the dark line seems to offer a fair target, and the burst of the shells might be more accurately observed.

Two batteries of howitzers, 12-cm., were employed at the manœuvres. These guns fire melinite or melinite and cresylite shells; heavy as they are, with huge glycerine brakes, they moved across country, and are likely to be far more efficient that the mitrailleuses, now discarded, on which so much dependence was placed by the last Napoleon and his military advisers.

Of the cavalry, again, I have to speak *en amateur*; and in this case I had but few opportunities of seeing the working of the arm in action. Where positions are of great length, 6, 9, or even 12 miles, and the squadrons manœuvre well out on the flanks, it is impossible for the ordinary spectator to see much of the cavalry unless he attaches himself to it permanently, and even then it is often possible that the day may pass by without an opportunity for its action.

However, on the march and in cantonments I saw a good deal of the mounted arm, and on several occasions I hit off the advanced patrols and contact squadrons. Whether their work was well done or not it is impossible for me to say. The Officers' patrols in France as a rule do not consist of more than two or three troopers, and where the front of the armies is very wide, 10 or 12 miles, for instance, the spectator who finds himself at some particular point between the two armies can be no judge as to whether the country is properly patrolled. I noticed, however, when the armies were in motion towards each other, that posts of about half a troop, who sent out vedettes and patrols, were established on the main roads. When the armies had reached striking distance the cavalry was seldom to be seen within the opposing lines, but I do not know that it would have done much good in such a position.

There are plenty of commanding heights in Champagne, and a Staff Officer, taking post on one of these in perfect security, could see as much as a whole regiment. At the battle of Vendeuvre some pretty scouting was done on de Galliffet's left, and both sides were covered by contact squadrons. Here, however, there were no commanding heights, and the view was limited from almost every point.

The French recognize the distinction between the two services of exploration and security. To the independent divisions is entrusted the task of leading the advance, dealing with the enemy's main body, and ascertaining the dispositions of his armies, whilst to the brigade of cavalry attached to every corps d'armée is assigned the service of covering the march. In the present manœuvres the independent divisions came but once into conflict. This was on the 5th September, whilst Generals de Galliffet and Davout were marching to meet each other. For this encounter I unfortunately arrived too late, but a full description appeared in one of the French military papers, of which the following is a brief summary :—

The two divisions on the morning of the 5th both advanced with the intention of occupying a hill near the village of Colombey-les-deux Eglises, this hill being a most important point, commanding the surrounding country and the key to several good roads.

The 5th Division reached Colombey first, and occupied the hill with its three batteries of artillery and a dismounted squadron of dragoons. Two contact squadrons pushed well to the front, one of which acted as escort to a section of sappers sent forward to block the high road through a village, soon reported the approach of the enemy, moving over a high ridge, about $2\frac{1}{2}$ miles distant. The 1st Division, here discovered, had no less than five batteries, two having been added from the corps artillery by General de Galliffet. Then ensued a rather long artillery engagement, during which a battalion of chasseurs, which had marched 6 miles in fifty-four minutes, relieved the dismounted dragoons and secured the occupation of Colombey. The 5th Division then rode forward in order to lure its adversaries down from the heights opposite, and the 1st Division, leaving a dragoon regiment to escort the batteries, left its cover to meet it. Both

divisions tried to gain each other's flank, and both attacked in three lines, a brigade in each. The 5th Division exposed its flank to the five batteries on the ridge, and its second line was charged by the dragoon regiment which had been left as escort to the guns. The three batteries of the 5th Division changed position three times during this action; those of the 1st remained on their commanding ridge.

The 1st Division, whilst manœuvring to gain the flanks of the 5th, covered about 2½ miles at the trot and gallop.

On the 7th, the day of the first battle, the two cavalry divisions found themselves some 7 or 8 miles in rear of the right flank of General Davout's army. Here there was very little cavalry fighting beyond a charge or two in extended order against infantry, and a dismounted attack of the 28th Dragoons of the 1st Division on the village of Blaise. Another village was occupied and barricaded by squadrons of the 5th Division.

On the day of the battle of Vendeuvre, the 1st Division, covering the right flank of the army to which it belonged, drove back a cavalry brigade, and then, reinforced by a corps brigade, twice charged the attacking infantry in flank. The 5th Division, on the opposing side, was employed at first on the other flank. It first held a village until the arrival of the infantry, for which purpose four squadrons were dismounted and occupied the border of a wood. It was then sent over to the other wing, but, having to traverse about 16 miles of difficult country, it did not arrive till the action was over.

On the 11th, during the advance against the masked enemy, the two divisions, now on the same side, moved in advance of either wing, the 1st Division being kept together on a single road, with Officers' patrols over a wide front, the 5th working in two columns. The front covered by the twelve regiments was about 30 or 35 miles.

On the 14th the two divisions were united, and attacked the enemy's cavalry in mass, the artillery (six batteries) being divided in two groups on the flanks. The divisions were reinforced by a corps brigade, and the whole force numbered fifty squadrons.

In France, as elsewhere, a great deal of adverse criticism has been showered, not so much on the French cavalry as on the cavalry Generals, and it is said their action or inaction by no means received the approval of the supreme authorities. This is a point on which I can say nothing. We have not heard the defence of the accused. It has been said that the cavalry missed many opportunities. But the cavalry cannot be everywhere, and when the front of battle extends to 7 or 8 miles it is manifestly impossible that it should be able to seize every opportunity that offers. I can only say that there appears little reluctance to use the cavalry boldly in the very heart of the battle, but it is very possible that the fact of the mounted arm being very seldom employed *en masse* at the manœuvres of the other arms deprives its leaders of all opportunity of gaining experience in combined tactics.

As to the general appearance of the arm, I should say that it compares well with other European cavalry. It is well horsed, on the

whole, though somewhat uneven in this respect, and the cuirassiers are under-mounted. The improvement in riding is very marked, and the divisions manœuvred easily and rapidly when *en masse*. The dragoons are armed with lances, but their brass helmets and the bright cuirasses of the heavies are exceedingly conspicuous, catching the sun at a long distance. The light cavalry, the chasseurs, look more workmanlike, both horse and man, than either, and their plain sky-blue uniforms are well adapted to field service. No horses under six years old are allowed in the ranks, but as the peace strength of the regiments, as in Germany, is greater than that for war, the ranks are not thereby attenuated. I noticed a good many sore backs, principally amongst the corps cavalry, and in all probability due to the unsparing use of the men as orderlies by the infantry commanders.

On the whole, the work done by the cavalry cannot be said to have been very heavy, but the distances at which the opposing armies were placed apart was small. Nevertheless from 30 to 40 miles per diem were often travelled by the divisions.

There are one or two points in connection with the cavalry which call for special notice. France has no mounted infantry, but she evidently intends to supplement the fire capacity of her horsemen. There were ten chasseur or rifle battalions engaged in the manœuvres, and the majority of these, at one time or another, were employed in support of the cavalry. These troops, perhaps the most highly-trained in the army, are magnificent marchers, equalling the Bersaglieri in rapidity of pace and also in endurance. I have already told you how the 5th Cavalry Division, at Colombey, was supported by a battalion which marched 6 miles (the packs being carried in carts) under the hour, and in all the cavalry operations these auxiliaries were used to hold important tactical points, and to set free the horsemen for the shock. At the same time, as you will have noticed, the cavalry is considered capable of fighting on foot, and of attacking on foot too.

I come next to the infantry, and I may say at once that I do not think any infantry Officer present at the manœuvres can speak of the French infantry soldier otherwise than in terms of the highest praise. The men showed so much steadiness and endurance, they were so cheerful and good tempered, even at the end of long and tiring days, they marched so well under their heavy packs (weighing about 50 lbs.), and they looked so like fighting, that it was impossible not to admire them. On the march, the men wear the long blue-grey *capôte*, with the skirts doubled back, the *képi*, and boots of much the same pattern as our own, with a broad sole and a low heel. In addition to his necessaries, each man carries his share of the cooking apparatus belonging to his squad, a bundle of firewood, a light entrenching tool, and a section of the *tente d'abri*. In the pack itself are carried the two days' emergency ration, a pair of white spats, and a pair of stout hobnailed shoes, and on the top of the pack is the shell jacket, worn in camp and cantonments. The shoes, spats, and jacket have to be put on immediately the companies dismiss after the day's work; and this is a most practical regulation, for the

man is not only benefited by having to change his boots, but he has also an opportunity of looking to his feet and to his socks, or to the greased rags which many of them wear in lieu. The French soldier needs little urging to induce him to look after his own health and comfort. Directly billets were taken up, the men might be seen inspecting their clothing, repairing rents, looking to their foot gear, and generally getting their kit into order for the next day's march. This habit has, doubtless, something to do with the excellent marching of the battalions, but it is very evident that much attention is paid to their training in this most important particular. The weather during the manœuvres was very hot, the thermometer sometimes reaching 95°, and even more; the marches were long, varying from 15 to 30 miles, the engagements were numerous, and the work, with the exception of the outpost duty, heavier than would generally be the case on actual service. And yet there were two points by which I was particularly struck: the few men who fell out, and the way in which the sections of fours kept closed up even at the end of a long march.

The marine brigade had a large number of casualties, but the ambulances attached to the infantry battalions, so far as my personal observation went, were never over-crowded, and were very often empty.

Discipline on the march was strictly maintained, and I think that as regards mobility, the French infantry of to-day is in advance of that of 1870; I might say very far in advance if I did not believe that the popular opinion as to the want of endurance amongst Napoleon's troops is based on insufficient evidence. The French armies, at the outset of the war, moved slowly enough, but this was due, I believe, rather to Staff mismanagement, such as delayed the passage of Bazaine's troops through Metz before the battle of Vionville. Of course the march to Sedan was an utter breakdown, but by that time, to quote the official account, "successive defeats, continuous retreat, and maladministration had utterly destroyed the *morale* and discipline of the troops."

The attack formation of the French infantry is the next point I come to, and it is one, I think, which merits attention, as it has certain marked peculiarities. The advanced guards, under cover of which the marching columns approach the enemy's position, are strong, especially in artillery, three batteries being detailed to the normal advanced guard of a division; and under cover of this screen the army corps deploy for attack as single units; I mean by this, that the whole twenty-four battalions move forward simultaneously, formed in three lines. The battle does not therefore proceed, as was generally the case in 1870, by a gradual reinforcement of the advanced guards; there is no strengthening the screen by driblets; but the attack takes the form of the advance of a mass of troops disposed on a narrow front and with great depth. In fact, the attack is made very much on the same broad lines as were the assaults of our own army in the Peninsula and at the Alma. I may recall to your memory Wellington's counter-stroke at Salamanca, when "he

observed," says Napier, "with stern contentment that the French left wing was entirely separated from the centre. The fault was flagrant, he fixed it with the stroke of a thunderbolt. A few orders issued from his lips like the incantation of a wizard, and suddenly the dark mass of troops which covered the English Hermanito seemed agitated by some mighty spirit; rushing violently down the interior slope of the mountain, they entered the great basin amidst a storm of bullets which appeared to shear away the whole surface of the earth over which they were moving. The 5th Division immediately formed on the right of the 4th. . . . The 6th and 7th Divisions. . . . were ranged on a second line. . . . A reserve composed of the light divisions, Pack's Portuguese, &c., remained in heavy masses on the highest ground behind them all."

When I compare the French attack of to-day with Wellington's offensive strokes, I do not wish you to understand that the French infantry depend upon shock tactics for success. To break and demoralize the opposing infantry by fire-action is their primary object, and there is no division of the assaulting force into two bodies each with a distinct duty, the first line to do the firing, the second to use the bayonet. In fact, the main principles of their offensive tactics are identical with those which appear in the latest edition of our own Field Exercise, with the exception that very great stress is laid on the results to be expected from the simultaneous advance of a great mass of men on a single point of the line of battle. The deployment in three lines preliminary to the advance is made with much attention to distances and intervals, and hurry is carefully avoided. But at the same time, I observed no instances of undue delay, and on two occasions, when counter-strokes were made, the troops got into position very rapidly and in excellent order. In fact, the staff of the corps d'armée seemed perfectly familiar with the art of handling large masses as single units.

The deployment being completed, generally outside the extreme range of the enemy's artillery, the several lines move forward together, the first line gradually breaking up into smaller and smaller fractions; these fractions gradually extend, and the firing line gradually thickens, until at about 1,200 yards from the position, the whole front is covered by a screen of men in single rank, each squad of twelve or fifteen rifles separated by an interval from those right and left, and the men moving with plenty of elbow-room. Behind come the supports, generally in single rank, then the battalion reserves, and in rear again, the second and third lines, and in some instances, a fourth line, or general reserve. Firing, when on the offensive, began, as a rule, between 1,200 and 800 yards, and I never observed much delay in the advance until the decisive range —within 500 yards—was reached. By the time the firing line had reached this distance, the supports and reserves had closed up, the second line was near at hand, and the advance was continued by rushes of 60 or 70 yards. Supports and reserves were brought up, and magazine-firing commenced. The second line now came forward, and after a very rapid fire bayonets were fixed, and with drums

beating, and the men shouting "*à la baïonnette*," the whole line charged the position.

Such is the general aspect of the attack, and there are certain details which are of interest. In the first place, the English Officers present were specially struck with the good order and regularity of the whole movement. Until the moment just preceding the assault, the successive lines advance at a steady pace, every portion of the force preserving its proper interval, and the men keeping their dressing, not absolutely accurately, of course, but sufficiently to give the movement an appearance of strength and cohesion which was most effective. Little less remarkable was the absence of noise. Whistles and signals are used by the Officers, and shouting is strictly prohibited. Thirdly, the company Officers in the firing line were left entirely to themselves. All Officers dismounted when within long rifle range, and everyone, from the Commanding General downward, retained the same position during the whole of the manœuvre. As the "Times" correspondent says in his description of one of these attacks: "The whole mass moves forward steadily and silently, until, perhaps, 25,000 men are in view beneath us, covering the face of the country for a space of more than 2 miles in length, and 2,000 yards in depth. Scarcely a mounted Officer is to be descried: between the various columns there is no visible means of communication. There is no shouting of orders, no galloping to and fro. The huge mass of men advances, directed and animated by a single will; but this will is communicated by a hundred leaders, each working in combination with his fellows, and from the moment he parts company with his immediate superior, left to exercise the responsibility to which he has been educated."

So far the mechanism of the French attack seems well adapted to modern battlefields; but in several respects, very noticeable at the manœuvres, the requirements of active service seem to be sacrificed to an over-scrupulous regard for the niceties of the parade-ground. First, the importance of cover during the advance is a matter to which little attention was paid. It is true that cohesion and order are of equal moment, and if cover be the chief object of solicitude the attack will certainly lose in dash and resolution. But, at the same time, to neglect opportunities of avoiding the enemy's fire is to diminish the fire-power of the firing line and to reduce the strength of the lines that follow. I certainly observed very few instances of either the reserves or the second or third lines manœuvring so as to utilize the shelter offered by the folds of the ground, by coppices, or other natural features. When the men found themselves behind cover, it was intelligently utilized, but there was no skilful leading, and certainly no manifest effort to profit by the favourable accidents of the field of battle. As I have said, this consideration is made subordinate to order and cohesion, but we may remember that the French soldier has always been distinguished for individuality and intelligence, qualities which, since the days of the Revolutionary armies, have made him famous as a skirmisher. The celebrated memoir written by Prince Frederick Charles, long before the great war, on

the art of fighting the French, recognized these characteristics and taught the Germans how to counteract them; still, according to a recent German writer, these characteristics bore full fruit in the battles of 1870. A remarkable study of the Battle of Woerth, by a German Officer, Major Hermann Kunz, favourably criticized in the "Militär Wochenblatt," has been reviewed in the June number of the "Contemporary," by Colonel Lonsdale Hale, who thus sums up the judgment of the author: "Whilst claiming superiority for his own Army in the knowledge of field service among the rank and file, he points out that what is termed 'taking advantage of the ground' seems inherent in the nature of the French soldier, whilst the German finds the art difficult to acquire. Under fire, the tendency of the latter was rather to get near each other, as if for mutual aid and help, whereas the French relied each on himself to reach the required shelter." But, as we are aware, in the war of 1870, the bonds of discipline in the French Army had become relaxed, and it is possible that the authorities, straining every nerve to assure discipline in the Army of to-day, have decided to entrust to the natural aptitude and intelligence of the Officers and men the task of utilizing cover when they have to face the fire of an enemy.

Secondly, in the endeavour to maintain order, intervals, and distances, not only was cover disregarded, but there was a deliberate avoidance of all intermingling of sections, companies, or battalions, and this, if our own experience in the Crimea and those of both French and Germans in 1870 are of the slightest value, made the infantry attacks an absolutely unreal picture of what must inevitably take place on a modern battle-field.

The firing line, when a decisive attack is intended, must be maintained at full strength, and we know, from the history of the German campaigns, that in order to do this, not only company will have to be piled upon company, but battalion on battalion. Confusion is inevitable; but the French, unlike the Germans, seem to consider the task of organizing, or, at least, of minimizing, this confusion, hopeless; at all events, I observed no attempt to accustom the Officers and men to the embarrassments and perplexities of such a situation. During the last stage of an attack, the two opposing firing lines were often to be seen, standing in the open, blazing away at each other at 200 or 300 yards range, with the lines beautifully dressed, and the second line lying down a short distance in the rear. This certainly did not agree with either what I have read or seen of war. Of course, it is just at this stage that the unreality of peace manœuvres particularly obtrudes itself. Where there are no casualties, no gaps in the ranks, where the troops cannot approach within a certain distance, and where the decision rests on the fiat of an umpire, who, having to take many things into consideration and to receive many reports, may take a long time to make up his mind, the five minutes, beyond which those who have experience of breechloader fire tell us that the crisis of an infantry fight cannot be prolonged, easily run on to half an hour, and the situation becomes absolutely unlike anything that is likely to occur in actual battle.

In connection with the formation for attack is the question of fire-discipline, and I think that, however high the praise that their admirers may award to the French soldiers of 1870 for the skill they showed in making use of ground, the desperate tenacity with which they held their ground, the brilliant dash and precision with which their counter-strokes were executed, and the order in which withdrawals and retreats were carried out, no one can say a word in extenuation of the reckless waste of ammunition and absolute want of control in the firing line.

To-day, so far as the manœuvres teach us, the military authorities have introduced a remarkable reform.

Up to the crisis of the attack, the fire is by volley alone, and these volleys were never "ragged;" the men were well in hand, words of command clearly given, and ranges and objectives always indicated. The men, as a general rule, altered the elevation as ordered, but I think that the section and squad leaders, who gave the executive words, paid more attention to firing a good volley than to seeing that the objective was understood. So essential is it considered that every rifle should be fired simultaneously, that over and over again I saw men firing who could not possibly see the enemy, with a bush or a tree a few yards in front; and, in this respect, all exertion of individual intelligence is evidently sacrificed to the great end of maintaining the very strictest control and the tightest discipline. The position while firing was generally good, whether on the knee or standing, and the 170 rounds that the men now expend on the ranges is a very great advance on the meagre allowance issued—30 to 50 rounds—previous to 1870. Long-range firing, that is, at ranges over 900 yards, I seldom saw; but on several occasions, the supports and reserves, served by the undulations of the ground, fired volleys over the heads of the firing line. I may notice here that endeavours to turn the enemy's flank were almost too constant, a practice very different to the direct shock tactics of of 1870. There are many other points, as regards the attack of the infantry, on which I should be glad to dilate, did the hour admit; but my time is limited, and I will only add one remark, which, perhaps, may serve as a useful warning to young Officers. We have been accustomed in England, every now and then, to hear a good deal about "drill and discipline." The words, coupled together, have been made the text of many an inspection oration; at all events, it has been impressed upon every Cadet, on his leaving Sandhurst, that they should be his watch-words during his military career. Now, the first thing that strikes one on seeing 110,000 troops deployed for action is how absolutely essential to an army, even on a modern battle-field, are steady drill and the strictest discipline. Until I saw 25,000 deploy for action in a very short space of time, it had never been so practically brought home to me what an important phase of an engagement such a deployment is, and how thorough a knowledge of close-order movements, what readiness in handling their commands, Officers of all ranks must possess, if it is to be effected without undue delay and the very greatest confusion. Again, the order, the quiet, and the precision of the advance

convey an appearance of strength which cannot fail to have its due effect, and I cannot but think that the strict discipline maintained by the French at every stage of the operation is in accordance with every teaching of history and experience. Of course fighting in an enclosed country at home would naturally bear a very different aspect to fighting on the great open and unobstructed spaces on the Continent. There, positions are clearly marked, the map shows them; here, even at Aldershot, it is extremely difficult either to guess or discover where the enemy is actually posted; and, while the work of the cavalry and advanced guards would be tenfold more arduous, a General would have the very greatest difficulty in knowing when and where to deploy his masses for a decisive attack. In fact, England is so thickly wooded, and so covered with hedge-rows, that the issue of a battle would depend more upon the intelligent leading of the firing-line, the use of cover, minor flank attacks, and the close co-operation of the battalion reserves, than on the simultaneous attack of an enormous number of men. It is well to bear this in mind when comparing our own with Continental tactics.

And there are other points connected with the French Army as to which we should be careful in making comparisons. National characteristics should never be ignored by students of war, and it would be unwise to set down the troops of another Power as inefficient because they pay little attention to matters by which we set much store. Englishmen who see the French and other troops in their ordinary garrisons, route-marching, on guard duty, or "walking out," are rather apt to write them down indifferent because they do not compare well with our own men in smartness and appearance; and when they observe sentries loafing on their posts, slovenly saluting, troops marching without keeping step, and harness old and unpolished, they are led to think that when such things are permitted very strict ideas of duty cannot exist. I may refer particularly to the French close-order drill and the manual of arms. According to our ideas nothing could be worse than either. So long as the men get into their places, so long as the rifles are brought to the shoulder, it does not matter how it is done. To see a French battalion forming fours or presenting arms would make the hair of an English sergeant-major stand on end. But, for all that, although the movements of the individual men have not the slightest pretence to precision or smartness, the movements of the battalions are very rapidly executed, and changes of formation are made with the greatest readiness. Still it is very evident that no more is exacted from the men than that they should be able to march without losing distance or interval, and to find their places in the ranks without confusion or delay. It is when the attack begins that steadiness, regularity, and strict discipline are first apparent; and when they are actually engaged on the field the French soldiers are best in hand. Directly deployment takes place everything tightens up. The slackness and shuffling observable at other times disappear at once, giving place to silence, alertness, and precision. In fact all other branches of military training, except marching, are made subordinate to duties under fire; and

it appears to be considered in France that inattention to details on the parade-ground is not incompatible with the strictest discipline in the field. Nor is precision in close-order drill and in the manual of arms understood as the necessary foundation for precision of movement, good order, and subordination, in battle formations.

The same observations will apply also to the somewhat easy relations between Officers and men. In the first place, France is a republic; secondly, numbers of the men in the ranks are socially equal to the Officers; thirdly, the ordinary usages of military etiquette are never strictly enforced; when speaking to an Officer the men do not always stand to attention, and the Officers seem perfectly indifferent to their attitude. At the same time I observed no want of respect and no undue familiarity; and although it appears strange to us to hear an Officer say to a corporal, "Will you please fire a volley in that direction," yet when irregularities occurred there was no lack of decisive language. I may observe, as a point of interest, that I have been told by Officers who took part in the Crimean campaign that the characteristics peculiar to the French troops of to-day astonished the English Army when the Allies first met in 1854.

Outposts during the manœuvres were not, I believe, invariably established, and, when they were, no night enterprises were allowed between the hours of 9 and 4. I do not know whether the piquets were usually withdrawn to cantonments at 9 o'clock; on two occasions I saw them making preparations to spend the night in bivouac. The duty of observation was carried out in much the same fashion as our own—double sentries and small recruiting patrols of a non-commissioned officer and a couple of men. The piquets often made shelters for themselves of straw, very quickly put together. On the march and during the engagements I did not notice much use made of either flanking or fighting patrols. Whether the former are of very much use in an open country in these days of long-ranging rifles is a doubtful question. To be of any value they must move at 800 or 1,000 yards on the flank of the line of march, a thing in itself almost impracticable, and a few mounted infantry would be far more effective. The fighting patrols, that is, scouts thrown out to secure the flanks of the battalions, especially when on the defensive or moving over broken ground, were, on more than one occasion, conspicuous by their absence; on others, it was not until the battalion had been some time established in position, although the flanks were exposed and the ground beyond hidden, that anyone thought of taking this precaution against surprise.

I have alluded to the unrealities which obtruded themselves in the field, especially during the infantry attacks. Many of these were due, it seemed to me, to the inexperience or insufficiency of the Umpire Staff. Seventy Officers were employed on this duty, and this number was perhaps too few; however this may be, the umpiring was unsatisfactory, very long delays taking place before a decision was arrived at, even in localities where the troops engaged were in no great strength. There is a very marked difference in this respect between

the French and Germans, much in favour of the latter; and it is certain that only by the rapid intervention of Umpires on the spot can the stages of an attack at peace manœuvres be made to represent the rolling backwards and forwards of the fight, the partial success here, the retreat there, the heavy reinforcement at one point, the heavy losses at another, which are the invariable features of the breech-loader battle.

The infantry entrenching tools were seldom used; never on the attack; but points on which to rally, and battery emplacements, were constructed by the engineers. Villages were invariably put in a state of defence, walls improved, shelter trenches thrown up, and the roads barricaded; but this work was left to the sappers. I may notice here that the front occupied by the armies when in line of battle was very long, averaging, when Generals Davout and de Galliffet were engaged against each other, from 7 to 8 miles for 50,000 men. The corps d'armée were kept well concentrated, but there were often gaps between them, partially occupied, it is true, by artillery, but still gaps for all that.

No description of the French troops would be satisfactory without some reference to discipline, for, as you are aware, history charges their predecessors of 1870 with much laxity in this respect. Manœuvres are not a very severe test of discipline, but I do not think that a soldier, mixing freely with the troops on the march, on the field, on the outposts, and in quarters, can fail to get some idea of the relations that exist between Officers and men, and also of the way in which duty is performed. Speaking for myself, I saw no symptoms either of insubordination, or disrespect, or carelessness in the execution of orders. The French regimental Officers look well after their men, especially in cantonments; they treat them in a very fatherly manner; much good feeling appears to exist between all ranks, and while discipline is strict and irregularities checked without hesitation, the Officers and non-commissioned officers, so far as I could see, always attend to the comfort of their men before considering their own. It is true that many of the non-commissioned officers, who are very young, appear shy of asserting their authority and want the habit of giving decided orders, but I never detected the least tendency to insubordination or slackness on the part of the rank and file. Under the most trying circumstances they were full of good humour, and the Officers set them an excellent example. The accommodation in the little towns and villages, which had generally the troops quartered on them in the proportion of two or even more soldiers to each head of the population, was by no means luxurious, and even the Headquarter Staff had to put up with very rough fare. But there was no grumbling to be heard; and the Officers, as a body, took very kindly to their mimic campaigning, and showed much interest in the operations. Maps (R.F., 1/80,000) and field-glasses were carried, and used, by every regimental Officer.

There are many other points which I should have liked to discuss, but time will not permit me to do more than refer to them. The use of a balloon by a Commanding General was a novel feature. At

the engagement at Colombey, General de Galliffet took up his position in the car, sending down his orders to *terra firma* by telephone. The balloon kept well outside extreme artillery range, and, the country being so open, must have afforded a wide view. It had this disadvantage, that it disclosed the position of the Commander, and the probable centre of his line. At Vendeuvre, the balloon changed sides, and joined the attack. Telegraphs and telephones were extensively used during the manœuvres; as were lamp signals, both by day and night. The commissariat department caused no complaint. The rations were plentiful and of good quality, but I heard there was some grumbling as to the want of water on one or two occasions. The empty wagons were sent back to the base of supplies by night, and the roads were thus left free for the marching columns by day. A great part of the supplies were procured by requisitions, sent in some time previous to the manœuvre period, but field bakeries were employed, and both they and small herds of oxen accompanied the troops. I do not think that any severe strain was put on the supply department, and the manœuvres afford very little insight into the capacity of the Intendance for providing for the wants of the vast armies France could put into the field in case of war, perhaps the most difficult of all military operations.

In conclusion, I may say that my impressions of the French Army may appear altogether too favourable, and you may think that I have looked at everything through rose-tinted glasses. I was glad to see, however, that an English artillery Officer, whom I had not the pleasure of meeting at the manœuvres, appears, judging from a very interesting paper in the Royal Artillery Institution Journal, to agree with all the conclusions at which we infantry Officers arrived. But there are people who, looking back at the mismanagement and errors of the great war, will not believe that a French army can be anything but rotten at the core. I will only remind such critics that Von Moltke's campaigns are now almost a matter of ancient history; that the French Army has been thoroughly reorganized; and, also, I would bid them remember that the French regular troops, despite the mediocrity of their leaders, their want of practical training, their faulty organization, and their long series of defeats, fought from first to last with splendid courage. How near they were to being victorious in more than one of the great battles in August, 1870, even German writers have not hesitated to own. The "Contemporary" article I have already alluded to is a case in point. "The more closely," writes Colonel Hale, "the episodes of the battle are studied, the greater the admiration with which the French private soldiers and regimental Officer must be regarded as combatants. The pure-bred Frenchman, as well as the Turco and Zouave, fought splendidly. The large number of Officers on the active list amongst the regimental leaders would in no way account for the stubbornness with which, when fighting a losing battle, they yielded the ground inch by inch; although it may have contributed to keep them together when, like lions at bay, they suddenly exchanged the *rôle* of defence for that of offence, and, springing on the foe, drove him back in headlong flight to seek

safety in the woods and vineyards. The percentage of losses is one of the best criterions of fighting stamina. In the French regiments, actively engaged, this percentage ranges from 29 up to 93·1, which latter practically means annihilation. On the German side the highest regimental percentage is only 37·62. Well," he adds, "might a German Officer of the very highest rank say, as he afterwards did, 'We were within an ace of losing the battle; but the French did not know it, and I hope they never may.'"

At the same time, I do not wish you to go away with the idea that I believe the French Army to be a perfect military machine. There is much pertaining to the efficiency of the army for war towards which the manœuvres do nothing to enlighten us. Do the Generals pull well together? Do they possess initiative? Can the artillery shoot? Are the infantry good marksmen? Here the manœuvres are no guide whatever. Nor were they altogether free from tactical blunders; but I very much doubt if any manœuvres, in any country whatever, passed off without giving many opportunities for criticism. Neither did the Officers always display capacity for command and thorough knowledge of their duty. But amongst a mass of men it is impossible that all should have reached the same level; there must be some distinguished by superior energy and decision, others who were never born to lead men in action.

To dilate on the shortcomings I observed would scarcely be profitable—"we are none of us infallible, even the youngest of us"—and in manœuvres as in war mistakes and blunders are inevitable. Nor, after the pleasant time spent in Champagne, would such a task be a congenial one; and I prefer to take this public opportunity of acknowledging, in the name also of my brother Officers, the courtesy and kindness which made everything so smooth for us.

One thing may certainly be said of the French Staff, and this is that they have proved themselves fully equal to the task of concentrating, feeding, and moving 100,000 men in a confined space, and also in dispersing them without delay to their respective garrisons.

It must be put down to their credit that the manœuvres, extensive as they were, passed off without a single hitch.

The CHAIRMAN: Major Henderson's lecture differs from other lectures delivered in this Institution, because, whereas some of them are almost bristling with points which give rise to discussion and argument, in the hope of changing the opinions of the lecturer, this of Major Henderson's, which I call a very admirable lecture, recites only his own experience of what he saw of the French manœuvres last year, and the opinions he arrived at. I do not suppose any of us think that we are going to change those opinions by what any of us may have seen; nevertheless there are gentlemen in the room who know a good deal about Foreign armies, and have attended the manœuvres of different countries, and I hope the lecture just delivered will inspire members with a desire to add to the amount of our knowledge on this subject, so as to carry out the principles which we all have most truly at heart, viz., how to prepare our own countrymen for successful warfare.

General Sir ARCHIBALD ALISON: I think I may say this has been one of the best lectures I ever heard, and one singularly suggestive. There are many things in it which make one think. I was particularly struck with the account of the mode in which the French prepared for the attack. It is such a

singular contrast to that which was carried out in the last campaign by the German Army. It showed a most careful arrangement of everything before the actual attack was delivered; not the hurry, into often disunited action, that was so frequently the case in the campaign of 1870, in order to support an attack made, without orders, by an advance guard with a small body of men. It seems to me that this is a matter of the greatest importance, and which ought to be most carefully gone into. I cannot help thinking that in this particular the French are entirely upon the right track, and the one which will be found in the end to be by far the most effective, and leading to the least loss in modern battle.

Colonel FRASER: I should like to ask one question. Can the lecturer give us any idea of the difference in height between the two tiers of guns? Can he tell us, roughly speaking, what was the minimum difference in altitude between the guns and the distance from the front to the rear line? One row of guns was down a slope, of course, and one behind it.

Major HENDERSON: One was on the ridge, and the other in the valley.

Colonel FRASER: A considerable distance below.

Major HENDERSON: I remember one occasion when it was very distinctly marked—at the battle of Colombey, where the top tier was at least 150 feet above the lower tier, if I remember, and the lower tier was at least 600 or 800 yards to the front. When they were in two tiers, I never saw them very close together. I should think they were always well over a quarter of a mile apart.

Colonel FRASER: What was the difference between the heights?

Major HENDERSON: 150 feet on one occasion that I remember.

Colonel FRASER: Can you say whether you are perfectly certain that the French batteries carried the whole weight of service ammunition?

Major HENDERSON: I did not inquire into that.

Colonel FRASER: That is a very important point, indeed, *i.e.*, whether there were 39 cwt. behind the horses. Did they move, for practical purposes, quickly enough for the infantry movement? I am not speaking of the Horse Artillery.

Major HENDERSON: Oh, yes, certainly.

Colonel FRASER: What distance was the balloon from the field batteries at the time they were supposed to be firing at it, when General de Galliffet was in it?

Major HENDERSON: We measured with a range-finder, and I think we calculated about 5,500 metres. We were behind the guns, but we took the distance with one of the little watch range-finders.

Admiral SIR ERASMUS OMMANNEY: May I be allowed to ask one question? This is the first time manœuvres have been carried out with the use of smokeless powder, and I would like to ask what was your opinion as to its general effect, whether it facilitated operations, or enabled them to carry a larger quantity of ammunition? What was the advantage which was obtained by the use of smokeless powder throughout the operations?

General GOODENOUGH: There is one thing for which we must certainly welcome the lecture. Major Henderson rather distinctly, instead of leading us on, as we have sometimes been led on, to admire everything that we see, and to lament the difficulty of getting it ourselves, has pointed to the difference between movements as practised in our own country with our own Army and those carried on in France. As to the outcome of the manœuvres in France, it seems to me that the attention of their Staff must have been directed in the highest degree to contending with the enormous difficulty of moving such huge masses of men, and that the points the lecturer has called attention to, of discipline and so forth, would be points that the French Staff made a great deal of, because they felt that everything should be subordinated to getting their large masses of men into position with order and regularity. How far we should go entirely for that, having regard to the smaller number of men with which we shall have to operate, and how far we should be led to disregard what we usually do regard, seeking cover, and adopting our movements to the exigencies of the occasion, is a question which I think the lecturer has done well in leaving to our discretion. There are one or two questions that I wanted to ask the lecturer, first, whether signalling was much practised in these manœuvres. Perhaps he can tell us whether he saw that use made of signalling in the field which we so often see attempted in this country. He has not mentioned it in his lecture. He also refers to

a map, but if he would kindly state what the scale of the map was which was in use by the Officers in the field it would be of some advantage, and also what was the material on which the maps were printed, whether thick or thin paper, linen, or any other substance. The water-supply we have been told was a difficulty; that is to say, the country was very ill supplied. I should like to know a little more in detail as to how the supply was obtained, both in camp and on the march. Also perhaps the lecturer will tell us, with regard to the Umpires referred to, was the system followed, which is usual in this country, of having Umpires attached to each side, or was there any attempt to place Umpires between the combatants, or as it were between the armies, or between the two wings of each force, to give directions and decisions, impartially to one side or the other, as between the opposing forces in any section of the field, rather than to have Umpires attached to each army, the attacking and defending, who have to compare notes afterwards and come to a decision? I should like to know which system there is a tendency to follow in France.

The CHAIRMAN: Ladies and gentlemen, as no other Officer wishes to make any remarks, I will not detain you very long. I have been very much interested in what Major Henderson has said about these manœuvres, and his criticisms seem to be very much what a great many of us have gathered from reports in the press and elsewhere. There are certain minor points, such as the movements of patrols on the flanks of columns, with which as details we need not concern ourselves. They must vary with the country, the nation, the enemy, the weather, and with many other considerations. Similarly, as to the system of cavalry exploration, whether it is advisable to distinguish the cavalry used for reconnaissance from that used for offensive or defensive purposes is a difficult point to decide. I was much struck with what Major Henderson said about the arrangement in which everything was put forward, and I noticed myself the same thing when I was attending the Austrian Manœuvres in 1886. There also the arrangement was first-rate. So far as we foreign Officers were concerned, we came in daily from the manœuvres in the course of the afternoon; and on the following morning at 6 o'clock we had a lithographed paper put upon the table, showing exactly what the Umpires had ordered as the result of the previous day's action, together with a map of the country in which the manœuvres were to be carried on, showing all the roads. Everything was to scale, so that when we were ready to ride out and see the fight we knew exactly where to go to. Similarly at the commencement of the day's manœuvres there was no shouting, no bugle sound. The General Officer gave his orders quietly. Those orders were conveyed through the Brigadier to the Commanding Officer, and the whole body of troops moved off in silence. There was hardly a sound heard till the firing commenced; all was done by direct personal communication, from the General down to the leader of each little squad, and each commander was absolutely free to act as he thought well. I think, if the discipline of troops will admit of it, that silence is of very great advantage on active service. There is only one other point, and that is as to the Umpires. I quite agree with Major Henderson. I believe that the largest amount of advantage from manœuvres for the Army will result from a thorough system of umpiring. Tactical faults at a field day should be corrected on the spot and at the time. Then all ranks benefit by the correction and learn. Frequent decisions by Umpires given during pauses in each day's operations are the most beneficial for troops, and, above all get the ablest and best informed Officers to act as Umpires. The result of all modern fighting must be disorder: and the problem for troops is to re-organize that disorder for fresh efforts; and in my opinion a carefully planned attack, such as Major Henderson speaks of, is not the best plan for instructing troops. I do not gather from this lecture that Major Henderson saw such a system of reorganization of disorder at these manœuvres, though no doubt he did see the extraordinary arrangements by which the French people have been able to feed and manœuvre 100,000 men in divisions, corps, and as one army acting on the defensive for such a force in a comparatively confined area, and that there was no hitch throughout. But, on the other hand, there was no enemy to create the hitch.

Major HENDERSON: The first question put to me was by Sir Erasmus Ommanney, asking whether, in my opinion, the smokeless powder most favoured the

attack or the defence. I think it is difficult to sum up the whole question in a single sentence. Smokeless powder certainly favours the attack in one most important point; and this is that the artillery are able to fire over the heads of their own infantry, until the latter get well within decisive range. As soon as the assailant has silenced the defending batteries, the two armies would be able to combine, in a much more effective manner than has hitherto been the case, against the defending infantry. With regard to the defence, there is much advantage gained by the visibility of the attacking lines. Their numbers may be easily estimated. It was different in the days of the old powder. Now, with smokeless powder you can see the first line and its fractions; the second line in rear; the third line behind again; and the reserves far away in the distance. In open country you can calculate accurately the number of troops you have to deal with. Then as to a demonstrative attack. We all noticed how soon it became apparent that it was only a feint; even the soldiers in the ranks used to laugh and say, "That fellow does not mean it; he is not coming on: the real attack will be from over there." It is easy, when there is no smoke, to see whether troops really intend coming on. The whole operation moved slowly; there was no energy about it; and you could see there were not so many lines in rear. In one way or another the demonstrative attack could always be detected, and this is rather an important point in modern tactics. General Goodenough asked about signalling. Signalling was very little used. The French have flag signallers, but I do not think I ever saw the flags taken out. They have a system of signalling with lamps and mirrors which can be used equally well by day and by night. I saw them used both by day and night, though not often. The stations I noticed were about a couple of miles or so apart; but they say in France that the stations can be much farther apart and that they can read the lamp signals quite easily at even 30 kilometres. They give a very bright light even on a bright summer's day, but they are rather clumsy to carry. As to the maps which were used by the Regimental Officers, I do not know on what material they were printed. I should rather fancy thin map card-board. They were on the scale of $\frac{1}{80000}$. The supply of water I cannot say anything about. I never saw water following the troops on the march, but they always had their canteen wagons; and their water bottles are filled not with water, but with wine.

General GOODENOUGH: The canteen carriages are not to be confounded with the water carriages?

Major HENDERSON: No, they are regular canteen carriages—cantinières. As to the Umpires, I can give very little information. There is an Officer here who probably knows more about the Umpires and their system than I do. I can give General Goodenough a copy of the Umpire Regulations. I think they were not at all satisfied with the Umpires at the manœuvres, and they think of changing the system.

General GOODENOUGH: My object was to get something which might be useful on the Proceedings.

Captain À COURT: I believe they had about 70 Officers, and they put every senior General Officer in charge, and each of these Umpires had certain sections of ground and a certain number of units to look after on both sides. Of course it is very hard work to follow exactly how they worked on each side; but, as I heard on several occasions, the Officers were not at all satisfied with the system.

General GOODENOUGH: You say that the instructions are embodied in Regulations?

Captain À COURT: Yes, there are Regulations.

The CHAIRMAN: I think, with your permission, I may give the thanks of the meeting to Major Henderson for his most excellent lecture.

Wednesday, July 6, 1892.

The Right Hon. LORD BRASSEY, K.C.B., in the Chair.

THE DIMENSIONS OF MODERN WAR SHIPS.

By Captain S. M. Eardley-Wilmot, R.N.

The Chairman: It is hardly necessary to go through the formality of introducing Captain Eardley-Wilmot to an audience who know him well, and who, I am sure, recognize his professional ability, and not only his professional ability but his ability in the use of his pen on important professional topics. The subject which he brings before us this afternoon is one of great importance, being nothing less than the ship-building policy of the Navy, especially of those types which are designed for the line-of-battle. The paper will, I am sure, be found of great interest.

Over thirty years have elapsed since the present reconstruction of our Fleet commenced. Iron then succeeded wood as the material of which the hulls of battle-ships were built, supporting masses of iron plates, considered essential for protection against that shell fire which certain operations of war had demonstrated to be so effective against wooden ships. The old smooth-bore gun, which had for centuries been the arbiter of naval battles, was replaced by rifled ordnance, gradually developing into the 110-ton gun of to-day. Two new weapons have come into play—the ram and torpedo. Steam, as a mode of propulsion, giving the movements of ships a freedom they had not before possessed, and assisted by the great weight of a modern ironclad in rendering serious a blow delivered at, or below, the water-line from such a source, has naturally induced many to place the ram in the front rank. Its power has been proved on more than one occasion. In the only action between squadrons of armoured vessels —that off Lissa—one of the two ships put out of action on this occasion succumbed to the ram. The unintentional application of this force sent the "Vanguard" and "Grosser Kurfurst" to the bottom. On the other hand, examples are numerous to show that, with two vessels manœuvring at equal, or nearly equal, speeds, this attack requires not only great skill, but an accurate knowledge of the path of a ship under varying conditions of speed and helm angle.

The torpedo, no less effectual when successfully applied, must score more victories before it is generally accepted as equally important. Recent experience, however, has shown it cannot be

ignored. The sinking of the "Blanco Encalada," an ironclad of 4,000 tons, by a craft one-fifth of her size, was an exhibition of the deadly nature of submarine attack full of significance. Neither gun nor ram, carried on such a displacement, could, it appears to me, have effected the same result.

But the main point I wish to bring forward in this paper for discussion is, whether we cannot now, after an experience of thirty years, formulate some definite rules on which the construction of a fleet should be based; the types of ships it should include, and their dimensions. It may be said this is impossible. Ships building to-day will be obsolete ten years hence; guns considered effective now will be shortly superseded by totally different weapons. This style of argument is much in favour; but I hold it is quite fallacious. We have ironclads now over twenty years old, which are still capable of most excellent service; and, indeed, our most modern types rather indicate a return to that so-called obsolete system of construction.

It should be remembered that now, more than ever, it is essential that, at the outbreak of war, we should possess a large number of ships. As Nelson wrote: "It is not merely a splendid victory of twenty-three ships over thirty-six which the country requires; that which we need is, that the combined fleet should be annihilated, and it is only *numbers* which can annihilate." But if it was important then, how much more so now, when it is considered marvellous work completing a first-class ironclad in three years. In the old days a line-of-battle ship could be built and equipped within six months.

We cannot now, therefore, count on supplementing our naval force to any considerable extent during hostilities, from our own resources, unless wars are of great duration. Nor should I be disposed to anticipate that much assistance would be derived from captured vessels, as in the past. Ironclads carrying thousands of tons of iron have not much reserve of buoyancy, and the under-water attack is directed towards sinking rather than capture. Hence our efforts should be concentrated on ensuring an overwhelming superiority, that losses could be at once replaced and fresh fleets formed to face the enemy. Under present conditions that nation will have an enormous advantage which, after a severe sea fight in which the losses may be great on both sides, can at once array in battle a second and third squadron, whether composed of the latest types or less recent ships.

Now, before entering upon the question of types and dimensions of modern ships, it will be interesting to observe how experience in the old wars led to the clearly defined grouping we see in the naval construction of that day. To those who wish to follow the various stages by which we passed from the strangely assorted fleet successfully paralysing the efforts of the Spanish Armada without any very clearly defined plan of action, to the formation of a line of battle composed only of ships of a certain rating, I cannot do better than refer them to the chapter on "The Differentiation of Naval Force" in Admiral Colomb's excellent work on Naval Warfare. Here I only propose to dwell upon the outcome of long experience and many wars in producing a class of ship in great numbers which was not the most

powerful of that day, but could, and often did, successfully cope with the best the enemy brought against us. At that period, the guns not varying much in size, the measure of a vessel's strength was the number of ordnance carried, and this could only be increased by additional tiers, which determined whether she was to be a two- or three-decked vessel. There were such things as four-deckers, but the species was rare, and I do not think we ever produced any of this class. There was a model of one proposed—the "Duke of Kent"—in the Naval Exhibition, but she was not built. We may consider the three-decker the largest battle-ship of that day, carrying from 100 to 120 guns. Forfait, the celebrated engineer, once said: "It is really the cannon which alone gives the law at sea." Those wooden ships never attempted to ram each other. They feared to lose their masts, and only as a last resort and preliminary to boarding were hulls intentionally brought into contact. As also the under-water attack was then unknown, the natural inference might be that for the line of battle only ships of the largest class would be built carrying the greatest number of guns. As a matter of fact, however, this was not the case. Two-deckers of various classes were constructed in the greatest numbers. When it was found that the smallest class could not cope in the line with the heavier craft to which they might find themselves opposed, their construction was abandoned, and the favourite type became the 74-gun ship. It was found that this class stood the blockading work better than the three-deckers. They drew less water, and usually had superior sailing qualities, while they could hold their own against the largest vessels of our enemies. They were not all of exactly similar dimensions in hull or spars. Indeed it is recorded that when off Cadiz Nelson had no less than seven different classes of 74-gun ships under him, each with a different establishment of stores and spars, so that if any one was disabled the others could not readily supply her wants. The 74-gun ship, then, was the type which the true test of war had demonstrated in those days to be required in greatest numbers. During the long peace which followed after 1815 they were gradually superseded by larger vessels, until in the Baltic, forty years later, their want was again felt. Sir Charles Napier wrote: "We seem to have quite forgotten that there are such seas as the North Sea and Baltic, where small ships of two and three decks are indispensable. There are also many places where the like qualification is necessary, and I well recollect during the siege of Cadiz we were obliged to look up all our old 64's with a light draught of water, so that they might lie clear of the enemy's shells. Another thing we seem to have forgotten, that all the work of the war was done by the 74's, and that the large ships did not stand the blockade as well as the small ones."

Though we did not towards the close of the long war discontinue entirely the construction of three-deckers, the number built was few, and they were kept chiefly as flag-ships on account of the increased accommodation they afforded. Under similar reasoning we should, I think, at the present time have a small number of ironclads of larger

bulk than the majority. Passing over that brief period of steam wooden ships which did not last long enough to undergo any crucial test, we come to the reconstruction of the Fleet with ironclad battleships. As representing the three-decker, we built the "Warrior," of 8,820 tons. The increased weight was due to armour, machinery, and coal. In view of the effect of shell fire, as demonstrated at Sinope and Sebastopol, it was considered essential that a large portion of the hull should be covered with iron plates 4½ inches thick, which involved, with the backing, a weight of 1,350 tons. The result was a noble vessel in which the protection was not given undue prominence. Approximately one-sixth of the total weight was devoted to what may be called the passive defence. As we now allot nearly one-third of the displacement to armour protection in one form or another, the change in this respect can be understood.

When producing such vessels as the "Warrior" and "Black Prince," we did not neglect at the same time to build smaller ironclads as representing the two-decker, and as well qualified to take their place in the line of battle. The "Defence" and "Resistance," of 6,000 tons, were considered powerful fighting ships; and when heavier guns and thicker armour resulted in our first-class battleships attaining a displacement of 10,000 tons we continued to construct ironclads of about 6,000 tons, of which the "Audacious" class is a worthy example, one of their advantages was that they could traverse the Suez Canal, and hence for many years one of these vessels carried the flag in the China Seas.

This feature of moderate displacement was further displayed in such vessels as the "Rupert," of 4,400 tons, also the "Conqueror" and "Hero," of 6,200 tons. But for some years we have discontinued building any battle-ship of less than 9,500 tons, and our latest so-called second-class ironclads, the "Centurion" and "Barfleur," are to be of 10,500 tons displacement. These will, I believe, prove most admirable vessels; and the point in my mind is whether we should not add largely to this class, and limit our supply of the bigger type—at any rate for the present—to those we already possess. Let us see what we can combine in a vessel of 10,500 tons as exemplified by the "Centurion." First there are four 10-inch 29-ton guns; a pair of them being contained in a barbette at each end. Though the movement of the turntable on which these guns are mounted is actuated by steam power, the operation of loading and making ready to fire is performed by hand. This by many is considered an important point. Armour to successfully resist perforation by these weapons must be limited to a small area of the hull, and consequently the target it affords may be neglected in favour of the attack of those parts protected only by thin armour, or without it. Associated with these powerful guns is an auxiliary armament of ten 4·7-inch quick-firing, or more properly speaking, quick-loading guns. The power of recharging a gun rapidly is equivalent to a greater number; but this very quality will tend to hasty aim, which must need constant supervision and firm control. As regards protection we are able to have a belt of steel, or com-

pound armour, 12 inches thick for 200 feet of the water line, out of a length of 360 feet. This is sufficient to resist penetration of all common shell, and almost any other projectile that can be brought against it under the varying conditions of a sea fight.

When in the early stages of ironclads the growing power of the gun had demonstrated that hardened projectiles could be sent through 8 or 9 inches of wrought iron, we should at once have sought to increase the hardness of the plate, instead of adding soft material, until we had attained to the monstrous thickness of 24 inches. It was only under the stress of foreign competition, and after seeing what the French steel plates were capable of, that our manufacturers turned their attention to a new material and produced compound armour. This has been still further improved lately, and can successfully resist the best steel projectiles. I think, therefore, we may limit the thickness in all cases to 12 inches. In addition to this vertical and external armour, the "Centurion" has the now usual armoured deck, and more protection to the auxiliary battery than has hitherto been given in the "Admiral" class of equal displacement.

As regards speed, though it is the most valuable quality in a cruiser, I do not think we should sacrifice too much for it in battleships. They will ordinarily be in company, maintaining a speed of about 10 knots. Circumstances may require this to be increased, and when on detached service it would be important to have the ability to keep up a speed of 15 knots for a considerable period. This should be well within the powers of the "Centurion" and "Barfleur," which are to have a natural-draught full speed of 17 knots. As the coal stowage for these vessels is sufficient for 1,000 tons, good provision is made for this important item.

The weight involved by a torpedo equipment is relatively small, so that this weapon can be fully developed in a ship of moderate dimensions. We find, therefore, that in a vessel of 10,500 tons we can combine a powerful armament, sufficient protection to the structure, and an adequate speed. When increased dimensions are given, the additional tonnage is chiefly taken up in providing more armour. Here it may be interesting to observe by the following table the progressive increase of displacement and amount of armour carried in the three decades since ironclads superseded wooden ships :—

Year.	Ship.	Total displacement.	Total weight of armour and backing carried.	Maximum thickness of armour.
		Tons.	Tons.	Inches.
1862	"Warrior"	8,820	1,350	4½
1872	"Devastation"	9,350	2,900	12
1882	"Inflexible"	11,500	3,500	24
1892	"Royal Sovereign" ...	14,200	4,500	18

By this we see that not only has the proportion between total dis-

placement and armour carried materially altered, but that the latter in our most recent construction is practically half the entire weight of our first ironclad, and equal to the displacement of a large cruiser. It must be remembered that this armour is all devoted to sustaining the ship against gun fire: that it makes her no more capable of withstanding the blow of a powerful torpedo or ram than if she were unarmoured, and that it necessarily curtails other qualities which, if vigorously applied, will probably prove the best defence.

Let us now consider the relative advantages and disadvantages of large ironclads. First, there can be no question that by adding to the displacement an individually more powerful ship can be produced. But if this argument is considered sufficient to outweigh all others, on what grounds should we stop at 14,000 tons? A vessel displacing 20,000 tons can be built in which every quality I have alluded to can be proportionately improved. It is only a matter of time, money, and material. This reasoning also applies to the argument that concentrated force in a single vessel is more effective than when distributed over a greater number of less power. In the discussion on the designs of our new battle-ships at the Institution of Naval Architects, Sir Geoffrey Hornby endorsed this view, but added, "I think it better we should have ships of medium size." He alluded to the disadvantage of very big ships in the matter of harbour and wharf accommodation. There is also the question of draught of water and existing docks rendered useless for large ironclads. These may seem comparatively unimportant details, but Commanders-in-Chief have in peace-time to give much attention to these points, and in war-time they might preclude the use of what would otherwise form a very convenient base of operations. Though some are of opinion that the Suez Canal cannot be relied on during actual or contemplated hostilities for the concentration and passage of war ships, it is at present debarred to the greater number of our modern ironclads owing to their deep draught.

The strategic advantage of two ships over one in covering a larger area of sea or coast can hardly be disputed. The power of detaching small squadrons from the main body for any service, without materially weakening the latter, is greater when the ships are individually less powerful but more numerous.

We cannot overlook such points as time and cost of construction. If we have brought the period of completion of such a ship as the "Royal Sovereign" within three years, we may safely assume that the "Centurion," and others like her, can be built and sent to sea in two. The gain of one year is important, and we may yet find methods of reducing the time.

As regards cost, the first-class battle-ship of to-day represents an approximate expenditure of a million sterling, as against about 400,000*l.* for the "Warrior," which in turn was about double the cost of the old three-decker. It is a serious matter for reflection, when we find eight vessels costing as much as twenty of our early ironclads, and nearly equal in value to all the ships engaged on both sides at Trafalgar.

We now come to the influence which the ram and torpedo have on the dimensions of ships, and they appear to me to turn the scale in favour of moderate tonnage and greater numbers. While we have continued to pile on armour to resist the above-water attack, that portion below the water line is still vulnerable, and cannot be made impervious to the effect of an explosion in contact, or the impact of another vessel at even moderate speed. In the case of two squadrons pitted against each other, in which one has a greater number of individually less powerful ships, the extra rams and torpedoes it puts into the line of battle give an accession of strength which may decide the issue at a critical moment. Thus, if we distribute 114,000 tons—which is the aggregate of eight vessels, each of 14,250 tons—among twelve of 9,500 tons—which gives the same total—we have four additional rams and twenty-four, say, torpedo-tubes. Twelve is not an inconvenient number for a squadron, and the power of bringing into play a few fresh ships at any moment of the action is a great advantage. It decided the day at Trafalgar. Though advocating that for the bulk of our line-of-battle fleet we should construct vessels of medium size, I see reason in possessing a few of increased dimensions for flag-ships in the Mediterranean and Channel. Independent of the increased accommodation which may thus be afforded, it is desirable that those in command should be in the most powerful ships. It would be highly inconvenient if the leaders were disabled early in an action, and the transfer of the flag to another vessel at such a time would not, probably, be practicable. Persano changed his ship at Lissa at the moment of going into action, thereby causing considerable confusion, and a gap in the line through which the Austrian Fleet safely passed. If we attach importance to the continuous guidance of the Admiral in command, we may allot more weight to the ship which carries him, and the position he would be in in battle for directing operations. His conning tower should have additional space and protection. Even with such extra provision in a limited number of vessels, I think their displacement should not exceed 12,000 tons, while the far larger proportion should range from 9,000 to 10,500 tons.

I do not attach importance to the argument so frequently put forward, that, because other nations build monster ships, or guns, we must follow suit against our own judgment. We should have the courage to abstain from such a course if we believe it to be unsound in principle. Our forefathers, at any rate, did not follow this course, but based their construction on what the true test of war had shown to be most needed.

Time will not permit me to deal at length with the dimensions of cruisers. In their case we do not find quite the same parallel with the past as with battle-ships. In the old days good sailing qualities were to be found in comparatively small frigates, whereas now speed under steam, and ability to sustain it ensured by a good supply of fuel, must be associated with length of ship and considerable displacement But we need not attempt to combine with these qualities the armour and armament of a battle-ship. Frigates never attempted to cope

singly with a two-decker, but took to their heels on meeting one, and a modern cruiser should do the same. Numerous light guns should form their armament, and if anything heavier is permissible, it should be a stern, not a bow, chaser. A more powerful antagonist coming up astern might thus be disabled before arriving at close quarters. One can understand the estimation in which the old 32-pounder was held. The gun weighed less than 3 tons; by the appliances then in use it could be manipulated with rapidity; and its projectile was easily handled. The nearest approach we have to it now is the 45-pounder, but the gun and carriage from which it is fired weighs 4 tons, while the 6-inch B.L. gun alone weighs 5 tons. Moreover, the latter is capable of penetrating several inches of armour, an unnecessary attribute in the attack of cruisers. I think it is generally admitted that until lately many of our small cruisers were too heavily armed, as detracting from their speed and other qualities in which a cruiser should excel. Chief among these qualities I place an adequate supply of coal, so that there may be no question of a vessel being able to proceed at speed to any locality with no intervening coal depôt. This is the more imperative now that we have practically abandoned auxiliary sail power. Such considerations entail increased displacement, and hence we find at the present moment no cruiser being built of less than 3,400 tons, while a large number are of 4,300 tons, and a few of 7,770 tons. If ever we have a maritime war again aproaching in duration that which terminated in 1815, I think we shall find that the cruiser of about 4,000 tons is found the most useful type, and our requirements in this respect will be large as regards numbers. The bigger cruisers will merge into second-class battle-ships specially constructed for distant stations, while important work will be found for smaller vessels between 2,000 and 3,000 tons.

I am not in favour of devoting any considerable weight to armour in cruisers. They will be overcome in battle, I take it, by the disabling of their personnel, and in these days of rapid fire and machine-guns, if any protection can be given, the crew should have a fair share of it. It seems to me we have got into the habit of considering ships in the light of not how hard they can strike, but rather how much hitting they can stand, and though it is perfectly legitimate to guard vital points, the best defence is, after all, vigorous offensive action. It is difficult to lay down any arbitrary law, but in the light of one who might have to take a cruiser into action, I should be quite satisfied if not more than one-twelfth of the displacement was devoted to protection. I am conscious how inadequate this paper is, as regards the importance of the subject, but it was undertaken rather to initiate discussion than with any idea of my being able to cope fully with a subject in which so many important considerations are involved.

Rear-Admiral LONG: My Lord Brassey, ladies, and gentlemen, the subject brought before us by Captain Eardley-Wilmot is one of very great importance. I should not like to be altogether silent, although I cannot hope to throw very much light upon it. There is one statement here which I think we should begin with:—

"Cannot we now, after an experience of thirty years, formulate some definite rule?" In another part of the paper he mentions the "true test of war." I think we should never forget the thirty years that has elapsed has not afforded us a "true test of war." I think it would be dangerous for any people to argue from experience unless they can find some means of applying the differences due to war conditions. I think there is a consensus of opinion about the importance of reserves. There probably never was a time when reserves were more important then they are now. The great difference, it appears to me, between our own times and those of Lord Nelson is that now a small vessel has the power of destroying a big one. That seems to be the cardinal fact. In the days of Trafalgar it was impossible with a small vessel to destroy a big one. Whatever we may make of that, that appears to be the cardinal fact of the situation. I think it is a very weighty fact against putting more money into one ship than you find necessary. But when we consider why ships are built, we must consider that they are built to fight in definite theatres of war and against definite enemies. It seems to me that, as regards limit to size, very much depends on what your possible enemies build. As we go at present, it appears that we are building quite as large ships as any one else, but I could not share Captain Eardley-Wilmot's opinion as to the desirability of the flag-ship of a squadron being a larger ship than any other vessel. Personally, if I were in command of a squadron, I would much rather have my vessel exactly like the other vessels, so that we should be all on the same footing. I think a homogeneous squadron is a most important thing to have. The great use of these very large ships that we are now building is for theatres of war similar to the Atlantic or the entrance to the Channel. There they would have a most undoubted advantage over any smaller vessels. But some theatres of war do not need such large vessels. I think the theatre of war and the vessels ships are intended to act against must govern the decision in most cases as to what it is desirable to build. I see at present the French are building five vessels of nearly 12,000 tons each, and they have nine others of about 11,000 tons—for these facts I am indebted to Lord Brassey's "Annual"—and Russia has four building, three of 11,000 and one of 12,500 tons, besides two very large armoured cruisers. I should like to say one word about the cruisers. Two, the "Rurik" and a sister, are vessels of 10,500 tons, much larger than our "Blake" and "Blenheim." I think we should have something of an equivalent size, because it seems to me the concentration of force which is so advantageous in a war-ship is nowhere more conspicuously so than in the large cruiser which can suddenly appear unexpectedly in some part of the world, and possibly do a great deal of damage if there is no other vessel able to match her on the spot. She would not take long about it; by the time you knew she was there she would probably be somewhere else. So that it seems to me, if our former policy is carried out, that we should pit one of our vessels against one of the enemy's, it is necessary that we should have a vessel adequate to cope with that other one of the enemy's, otherwise we shall be in the awkward predicament of telling off vessels for all of them except one or two which are much bigger than anything we have got. As to the point that Captain Eardley-Wilmot puts forward so strongly about the armour, it certainly does appear that we have gone to the extreme in the amount of armour on our vessels. It is not necessary because a ship has large displacement to devote that to armour; you might have more speed for it, and it seems to be a very nice question whether we might not with advantage have rather more speed in our large ships and a little less armour, perhaps. Opinions no doubt will differ on that point. I think the strategic advantage of two ships over one in covering a larger area of sea or coast is a most important point. I believe a great many naval Officers would concur entirely in that view. I know Admiral Randolph told me he thought that a very important point. Captain Eardley-Wilmot thinks one-twelfth of the displacement devoted to protection in a cruiser is sufficient. I think that is about the amount in the case of such vessels as the "Pearl" and "Flora," that are now being built. I am very much obliged to Captain Eardley-Wilmot for his paper.

Admiral P. H. COLOMB: My Lord, I am afraid that, although the Navy is not a political service, yet that, looking to the small numbers of our audience, some of us are more concerned with the dimensions and character of majorities than with the

dimensions and character of war-ships. I think it was most important that this paper, the first of its character, should have been read in this Institution, and I consider that the lecturer has been wise in giving us simply a tentative paper leading up to discussion and clearly to be followed by other papers following up, the thoughts which will have been set in motion by the paper read here to-day. I have always found it, myself, extremely difficult to get concise and satisfying arguments as to what the dimensions of our ships should be. We can point easily to individual instances of mistakes that have been made; we can point also to some general principles which should arrange and limit the dimensions of our ships; but when we come to tonnage and force we find ourselves rather met by the difficulty of putting principles into practice. I think we are greatly indebted to Lord Brassey, our Chairman, for so continually harping upon this necessity for taking care that we do not exaggerate dimensions. He, like the rest of us, has laid down principles and given warnings, but he, like the rest of us, has generally been unable to go much beyond those general ideas. But it is the function of a paper of this kind to set our minds going so that we arrive—I might say almost unconsciously—at means of definition which did not present themselves before our brains were set in motion by the words of others. I think the lecturer is quite right, and that we are all agreed that the fact—also adverted to by Admiral Long—that small ships can now destroy big ones is a distinct element in the size of your ships, that we cannot afford to have our big ships running the risk of being destroyed by the small ones, because naval warfare is most especially a question of the money-bag. It is most especially the question of whether your money will hold out. It is most especially the question of producing force in the most economical way, and if we have very expensive ships subject to destruction by very cheap ships, it is clear that we are not acting economically in principle. I never was more struck with this question of dimensions than when I was writing the chapter which has been alluded to to-day, "the differentiation of naval forces." It struck me so very strongly how our forefathers were driven, almost in spite of themselves, into certain lines: how they began very much as we began, with a new Navy of ships of all sorts and dimensions, without apparently much thought of what was to be done with them when they were built; and how gradually they were forced, both as to line-of-battle ships and cruisers, into particular directions, in which they only seemed to get hardened as war went on. They first separated from the line-of-battle the smaller ships, so as to put those ships that were fighting together more on an equality one with the other, although the equality varied a good deal. They secondly began to separate their cruisers into two or three classes. In the case of the line-of-battle ships they distinctly struck off the smaller ships, and they distinctly struck off the larger ships, and as distinctly increased the number of the medium ships. In the case of the cruisers, they broke them up into very distinct classes; they got rid of the very large cruisers with which they had begun, they chose a class somewhat below them as their largest frigate, and then they made a large gap before they came to what might be called their second-class cruisers. Then from that second class they fell to an enormous multitude of very small ships. When we began to build ironclads we had, we may say, the "Minotaur" (10,000 tons), the "Warrior" (9,000 tons), the "Audacious" (6,000 tons), and the "Rupert" (5,400 tons), all practically side by side. I cannot help thinking that we never should have done that sort of thing if we had been then as much in the habit of studying history as we now are. We should have been more likely to have struck out some medium line of ship of about 8,000 tons to have represented the whole of that class of ship, and, taking the money cost of these various classes, we should have found we could have produced a considerably larger fleet of the medium size of ship than we did produce by having considerable extremes in the dimensions. Passing to the cruisers, Admiral Long seemed rather to argue against himself when he pointed out the necessity of having ships to match ships that the enemy build. History shows us that that practice has never done us very much good. That idea built unquestionably the "Blake" and the "Blenheim," and the reduction in the size of the first-class cruisers that followed the launching of these ships shows distinctly that the building of the "Blake" and "Blenheim" was a backward step. I believe it is quite certain that the more we know of these two ships

the more we see that if we had had three ships of 6,000 tons instead of two ships of 9,000 tons, we should have had more force, practically more for our money. The moment we begin to follow the lead of our possible enemies, and to build certain ships because they build them, we lose hold of the principle which should guide us, and we begin to concentrate our attention on the particular ships which we have in hand, and we lose the idea of her relations to the whole of the naval warfare which may be forthcoming. Therefore, I think shipbuilding to outmatch particular foreign ships is a thing which ought to be discarded finally and fully. Because an enemy builds a particular class of ship, we ought not to attempt to build a ditto. We cannot guarantee that these two ships will ever come in contact. If we hamper ourselves by building ships of that particular class, we are very apt to build a ship which is only useful for certain purposes, and yet never comes into use for the purpose for which she was designed. We must take a general view, and an average view, roughly, of what our ships have to do, and build accordingly. What duties our cruisers have to do are pretty clear. We all know we must have scouts to accompany our fleets; it is clear that these scouts ought to have an enormous coal supply, because they must be able to run to and fro; they must be prepared to waste enormous quantities of coal in looking out in particular directions, all of which may come to nothing, and yet they must have the coal ready at hand after they have so wasted it. For that purpose we must clearly have large ships, but we need not have ships of great force; we must allow that such ships are to run away from superior force in exactly the same manner as frigates in the old days ran away. It seems to me that after we have a sufficient supply of ships which are intended to scout for battle-ships, and for no other duties, we need not follow up with any large cruisers after that. It would be better to multiply great numbers of small cruisers, because of the great work they would have to do—the watching of ports, the guarding of trade routes—all that sort of work which number, more than force, is required for. I have only spoken (because, as far as I can see, we cannot go any further at present) of some of the general principles which should govern the dimensions of our war-ships, but I feel sure of the effect of a paper of this kind, however small the audience may be, and however compressed the discussion may be by the few who take part in it; when it goes into the Journal it goes all over the Service, and all who read are set thinking about this particular question of the dimensions. All sorts of arguments which are not present to our minds now will arise, and ultimately they will react back to Whitehall, and set the brains there, who have to decide the dimensions of the ships, thinking of them from a more general and a wider point of view than ever they have been able to think of them before.

Admiral Boys: Perhaps I may be allowed to say a few words, although I much prefer in this Institution that the discussion of lectures should be carried on by those who are likely to have the subject under consideration in their own hands, and by much younger men than myself. As I do not think our lecturer would wish any exaggeration to go forth, there is one point he mentions that might be explained. He says that "in the old days a line-of-battle ship could be built and equipped within six months." Now, Sir, I am not aware there is a foundation for that report. I do not remember that it ever was done, and I scarcely think it possible. As to the size and dimensions of ships I cannot quite agree with my friend Admiral Colomb. The old adage that the weakest must always go to the wall applies as much to ships and fleets as to anything else, and I certainly must adhere to the principle that has existed hitherto that if our possible enemies build ships of a certain type and power we must have some equal to them or, in fact, superior, in all respects. With regard to the large ships, although it is possible they may be destroyed by smaller ones, we must recollect that, besides their superior defensive power in armour and their offensive power in guns, they can sustain a much greater amount of injury than small ones and still continue efficient. For instance, a torpedo that might sink a small vessel might not seriously damage a large one. The large vessel, from her construction and size, might have sufficient extra buoyancy to keep her afloat and in a fighting condition. As an instance was given just now, a frigate in former days would never attempt to attack a line-of-battle ship. It was considered a point of honour if a frigate came unexpectedly

across a line-of-battle ship she would endeavour to escape; if that was not possible she would haul down her colours. I think a similar practice must continue to the end of the chapter. What we want in this country is some other naval Powers to go to war; then we might discover what are really the present requirements for naval warfare, which are now, to a great extent, conjecture. I cannot myself believe that two or three small vessels, unless under very favourable circumstances, can cope with a large one. The large one contains more advantage in herself. If you can be assured always that you would have your two or three small vessels to meet the large one, then I grant it there would be some reason for that view of the case; but, under the present circumstances, if you do multiply your ships you cannot expect them to be always available at the right time; they must be distributed. With regard to the torpedo, I think Captain Eardley-Wilmot over-rates its value. The only instance we have of a ship being destroyed by a locomotive torpedo was the "Blanco Encalada," and that was a case, as far as we can hear, of the greatest neglect, the ship lying at anchor in a roadstead totally undefended. All the experience of the few naval actions of late years has tended to show that ever since the introduction of steam, of ironclads, and of scientific gunnery, the most powerful ship must win. In battle power means large *dimensions*, and England must not be behind in any type of fighting ship.

Admiral Sir ERASMUS OMMANNEY: I merely rise to express the very great pleasure I have had in listening to what I call a most common-sense view of the various questions connected with the size of ships. I have had no experience myself of the Navy of the present day, but I am certainly strongly in favour of the medium ship. I think that is one of the best points in Captain Eardley-Wilmot's paper, that if we go much further in the size of these ponderous ships there will be very few of the enemy's ports that they will be able to enter and do damage, in addition to want of handiness in managing them. I merely rose to express my opinion on this one point, that I am strongly in favour of the medium ship. I am sorry I cannot say anything more as to the ships of the present day, for I know very little about them myself. You must remember this, that in former wars which you talk so much about, the French ships were far superior in construction to the English ships, and were better provided with heavier ordnance, and yet in all cases we managed to defeat them.

Captain MAY, R.N.: I am sure we are all in favour of small ships; in the same way we should all like to live in first-rate style on 500*l.* a year, but the question is, Can we do so? The lecturer has taken us back to history, and he has shown us how in the old wars the 74 gradually elbowed out the three-decker; he has also given us the reasons for that:—"It was found that this class stood the blockading work better than the three-decker. They drew less water, and generally had superior sailing qualities, while they could hold their own against the largest vessels of our enemies." Now do any of these arguments apply to the big ships and the moderate-sized ships of the present day? Is the moderate-sized ship likely to stand blockading work, that is, rough work at sea, better than the big ship? As far as I have seen, wherever there has been rough weather at sea, the big ship has shown her great superiority;[1] which seems to show that we are not now in the same position which we had reached 100 years ago, that is to say, when the limit of extreme size had been reached that they could go to comfortably. "They drew less water." Certainly the moderate-sized ship does draw less water. They "usually had superior sailing qualities." Does the moderate-sized ship of the present day go faster than the big ship? Sitting, as I am here to-day, by the side of Mr. White, who has had most extraordinary success with his big ships recently, I do not need to remind you that under steam it is very much easier to drive a big ship fast than it is a moderate-sized ship. "They could hold their own against the largest vessels of our enemies." The lecturer has alluded to the "Centurion" as against the "Royal Sovereign." Now the "Centurion" has, roughly speaking, from 50 to 60 per cent. of the weight of armour and armament that the "Royal Sovereign" has. Now is it reasonable to say that a ship with 100 per cent. in

[1] An interesting comparative trial is now taking place between the 14,000-ton "Royal Sovereign" and the 10,500-ton ship of the "Admiral" class.

guns and armour will not beat a ship with 50 to 60 per cent.? Surely our designers must be all wrong if that is the case. I do not think the "Centurion" could possibly be considered fit to "lie in the line," as the old sailors used to say when the enemy's line was composed of big ships of the strength of the "Royal Sovereign." Therefore I cannot see, however desirable it may be, that we can at present afford to reduce the size which has been found necessary to meet the requirements of naval Officers, because it is naval Officers that have asked for this, that, and the other, and it has been found that it cannot be done under 14,000 tons. Then as to the question of cost, it is said, again and again, you can have two ships of 7,000 tons for one of 14,000. Surely that is a fallacy. I will not go into the absolute question as to whether a ton of displacement always costs so many sovereigns, but there is another very important point connected with that, and that is the question of the men. The "Centurion" has about 600; the "Royal Sovereign" about 650. I made a rough calculation that a man costs about 3,000*l.* That is to say, the Estimates devoted to the personnel of the Service are about 7 millions; that provides for about 70,000 men, or 100*l.* a year a-piece. Capitalize that and you get 3,000*l.*; therefore the complement of the "Royal Sovereign" costs about 2,000,000*l.*, and as the ship herself costs something short of a million, you get for the "Royal Sovereign" a total sum of about 3,000,000*l.* That is the sum that you would have to subdivide between these smaller ships, and you will find that the complements of the smaller ships are so expensive that, instead of getting two 7,000-ton ships for one 14,000, I do not think you will get more than three of the smaller ships for two of the big ones. At any rate, I think it is a thing that should be considered and thoroughly threshed out. Then, as regards cruisers, we had just now a demand for very great coal capacity and speed; we cannot do that without size. Again, the enemy is starting big cruisers; I won't name them, but we know them all, and it is hopeless to catch a cruiser of 7,000, 8,000, or 9,000 tons if those 7,000, 8,000, or 9,000 tons have been well disposed, with a ship of 4,000 or 5,000, and if you do catch her, it may not be a very pleasant operation. So that, as far as we have gone as yet, I do not think we can relax our efforts in building at any rate as many big cruisers as we shall require to catch the big cruisers that already exist abroad.

Mr. W. H. WHITE: I have read this paper carefully, and came here, not intending to take part in the discussion, but rather to listen to what naval men should say respecting the requirements for Her Majesty's ships. Something has been said on that subject by Admiral Colomb: and I understand that Admiral Long has also given his views. Admiral Colomb said that some of the remarks made by Admiral Long were "self-destructive." As I listened to Admiral Colomb's statement of what was necessary—not desirable but necessary—in a modern cruiser, I had the same feeling, viz., that his remarks were self-destructive. If instead of laying down general principles he had attempted, with the help of some naval architect, to formulate his wishes in an outline design, he would have found that the "Blake" and "Blenheim" were too small to fulfil all his conditions of speed, coal, and armament. The "Blake" and "Blenheim" did not reach 9,000 tons displacement without good reason. They were not built according to any hypothetical conditions. The design was not made simply for the sake of beating vessels that existed in other navies. These two cruisers were built to satisfy conditions specified by the Board of Admiralty as regards speed, armament, coal-endurance, and protection. Hence they reached 9,000 tons in displacement, and a certain cost. The burden of this paper, to a great extent, and the remarks that have been made in the discussion, appear to me to proceed upon a mistaken groundwork. The policy of war-ship construction is not a question, I take it, of first fixing the displacement of a ship and then seeing what is the best which can be done on that displacement. One can make endless things out of 10,000 tons displacement. One may produce a very fine cruiser or an indifferent battle-ship; one may split up the total displacement into a number of vessels of small displacement. With great respect I would say that it is the function of the Board of Admiralty to decide at any time what the various types of ships in the Navy shall be capable of doing. The work of myself and my colleagues is of course simply to say what are the sizes and costs of ships fulfilling the requirements laid down by the Board

of Admiralty. A discussion such as this may serve a useful purpose in assisting the Board of Admiralty in the performance of their difficult duties by putting on record the opinions of naval Officers, but it does seem to me a very left-handed proceeding in discussing types of war-ships to begin by naming the displacements and then seeing what qualities can be obtained on the displacement. If an agreement can be reached—either on the basis of history or a survey of modern conditions—as to what should be the speeds of first-class battle-ships, what shall be the coal supplies ,what the protection and how it should be disposed, respecting which features one finds little exact expression of opinion in the paper—then a great point will be gained. Captain May has in his remarks pointed to the fact that in the paper there is an entire disregard of the enormous change in conditions introduced in connection with steam propulsion as compared with propulsion by sails. I would support Captain May's views. In the case of sailing vessels the frigates could get away from the line-of-battle ships; and very often the smaller vessels could get away from the frigates. But that is not true of steamers. A torpedo-boat may get away from a battle-ship, if the weather suits and if she is in perfect condition. The torpedo-boat, however, comes to be so fast as she is by accepting many sacrifices that could not possibly be imposed upon a vessel intended to keep the sea in all weathers and to take a place in the line of battle. What is true in those extreme cases is true also in other cases that might be mentioned. One may with propriety accept certain restrictions in vessels of comparatively small cost which could not be accepted in vessels designed for the line of battle. The differentiation in types of sailing war-ships, which Admiral Colomb has so ably discussed, does not in these days of steamers justify the contention that the Navy should now chiefly consist of medium-sized battle-ships. As in the past, so in the future, it seems that whatever types of ships may be needed to fulfil the multifarious duties that come upon the Navy they should be provided. And I would say further that in this country the bill will be met without a murmur if it can be shown that the necessity exists. With all respect to naval Officers, I may add that in discussing these matters and asking for information, I have the greatest difficulty in finding agreement upon points affecting war-ship design. No doubt that is an inherent difficulty of the case. If we go back to the year 1888, when the Board of Admiralty had to frame its new programme, members of this Institution will agree that no more business-like proceedure could have been followed than was then adopted. Designs were not settled and simply put down to be formally "approved" by the distinguished Naval Officers summoned to confer with the Board of Admiralty. On the contrary, the conditions were stated broadly; alternative designs were put before the Officers summoned; and, in the end, there was practical unanimity in recommending the acceptance of certain conditions of offence and defence. To fulfil these conditions a very large line-of-battle ship had to be constructed, and the "Royal Sovereign" was the result. In comparing the "Centurion" and "Royal Sovereign" I want to avoid technicalities: and, as the designer of both ships, I may say that it is most interesting to compare them by their displacements only. The "Centurion" is a vessel of 10,500 tons, wood sheathed and coppered; that is to say her displacement is increased very largely, simply by the condition that she should be suited for distant service and be able to keep out of dock for long periods with no serious loss in speed. In the paper no mention is made of the influence of this sheathing upon size and cost, but it is really very considerable. Again, the "Centurion" was designed to go through the Suez Canal with the greater part of her coal on board; and is intended to have relatively high speed. It will be quite recognized, I presume, that to get high speed with a moderate draught involves considerable difficulty as compared with deeper draughts. That also affected the size of the "Centurion." But these are only examples of what I mean when I say that the conditions governing the designs of different classes of ships in the Navy are so manifold that there must always be a great number of types existent side by side; some large, some medium, and some small. If Captain Eardley-Wilmot desires to treat this subject of the dimensions of ships in a broad and general fashion, he must give more attention, not to mere displacement, not to mere length and breadth and draught, but he must formulate clearly what are to be the fighting and steaming qualities of ships necessary for fulfilling special duties in the Navy.

Admiral Sir MICHAEL CULME-SEYMOUR, Bart.: Several gentlemen having said they would like to hear something from Naval Officers who have been lately at sea, so that the discussion should not be confined altogether to gentlemen who have not had recent experience, I should like to say a few words. Now, with regard to the ironclads, I am very much inclined to agree with Captain Eardley-Wilmot that a size of about 10,000 or 11,000 tons is a size that is suitable for the Navy; and that, although it is essential that we should have larger and more powerful ships than any other nation, they should not be more than is necessary. The argument, that because a large ship may be destroyed by a torpedo, that, therefore, you should not build large ships, will not, I think, hold water. It may be a possibility, but the chances are against it. But what I principally wanted to say was a word with regard to the cruisers. I have studied this question a great deal, both whilst in command of the Channel Squadron lately and in command of the Northern Fleet last year, and I have come to the conclusion that what we want in a cruiser is that she shall go fast, that she should be able to go against anything, and that she should have plenty of coal. Now, I think if you asked Admiral Sir Geoffrey Hornby his opinion when he had command of what you may call the first manœuvres, he would tell you that the "Oregon" was invaluable, that she had no armour in any way to speak of, but that she could get information from anywhere. I was speaking to him the other day, and found that he was excessively strong on that point. What you do want is great speed and large coal power; protection and guns must give way to that. Mr. White says you cannot do everything; that one wants a lot of guns, that another wants a lot of coal, a third wants speed, another one plenty of armour, and another says it is to cost but very little. For my part, I should put down this formula, that the ship must steam fast, that she must have plenty of coal, and that the protection and guns must give way to that. The Americans are building cruisers to carry 2,500 tons of coal; the "Blake" is nowhere at all compared with them. That is what I hope the Admiralty will keep in view, that if you are going to have scouts, they must carry a great deal of coal, and they must steam fast, and I am not at all certain whether these auxiliary cruisers would not be a great deal better than the "Blake" and the "Blenheim"; for instance, the "Umbria" might steam 10 knots for three months without taking any coal on board. I think that is a very important point.

Mr. W. H. WHITE: The "Oregon" and other vessels alluded to, which might be used as auxiliary cruisers, have much greater displacements than the largest man-of-war cruisers ever built. The American cruiser to which Admiral Culme-Seymour referred as having a capacity of 2,500 tons of coal, if she has that 2,500 tons on board, will also be of greater displacement than any other cruiser that we have; although she is to be lightly armed.

Admiral Sir CULME-SEYMOUR: I only wished to put the general principle forward.

Mr. WHITE: What I mean is, that these are very large ships.

The CHAIRMAN (Lord Brassey): In concluding the discussion, I will venture to say a few words. Anything I do say, I say with great deference in the presence of Naval Officers, who alone are competent to advise the country on these subjects. But there are one or two general observations that I think I may venture to make. I am quite sure that Captain Eardley-Wilmot, in propounding the views that he has put forward in his paper, and which I am sure have been favourably entertained by this meeting, which, if not numerous, is certainly representative of the best ability in the Navy, does not imply any adverse criticism on the work that is now going forward in the Dockyards. The great programme of construction now in course of execution, and I am happy to say, near completion, represents as satisfactory and effective an application of that large sum of public money as naval wisdom could possibly devise. We have been reminded by one or two speakers that there is a considerable amount of excitement going on out of doors, upon which, in the calm serenity of this theatre, we can look with some degree of complacency. I may make one absolutely non-party observation in this theatre, and I will say this, that within our particular range of view, viz., the administration of the Navy, I do not believe it would have been possible to have administered the

Service more satisfactorily and more ably than it has been administered by the present Government. If they suffer a reverse at the polls, it will not be through their naval administration. The programme which is now in course of construction represents, as I venture to say, a thoroughly judicious application of public money. I cannot conceive that it can be considered that those great ships which are now being completed are any other than most valuable additions to the Navy, but the question which Captain Eardley-Wilmot raises has reference to the work of the future. What are we to do when we are drawing near to the completion of the present programme and laying out a scheme for another term of years? Captain Eardley-Wilmot, and I suppose he is carrying with him all his brother Officers, is strong on the importance of numbers, and he reminds us of the many great perils of naval warfare from which no ship, no type, the largest and most powerful, can be exempt. He has referred to the dangers from night attack by torpedoes; the danger of running ashore; the danger from fog; the danger from under-water attack by the ram, against which the first-class battle-ship is not more exempt than the "Barfleur" or the "Centurion," the type which he recommends for multiplication and for additions in any future programme. Having regard to these great dangers of naval warfare, it is, so far as it is possible, desirable to divide risks, and to have the advantage of numbers on your side. Looking to the desirability of having the advantage in numbers, Captain Eardley-Wilmot directs our attention to the "Barfleur" and the "Centurion," and he advocates that more ships should be built of that type. Captain May is doubtful on that point. He reminds us of the points of superiority which can only be secured by going to the large type of the "Royal Sovereign." Well, but in what respects are the "Barfleur" and the "Centurion" inferior to the "Royal Sovereign" type? They do not carry guns of the same calibre; they are armed with four 29-ton guns as against four 67-ton guns. That, no doubt, is an element of inferiority, but if the 29-ton gun is sufficient for the work that you want to do with your naval gun, it seems to me that the superior power of the 67-ton gun is not sufficiently material to lead you in all cases to say that you would build "Royal Sovereigns" rather than "Barfleurs." Well, then there are other points on which you may make comparison. There is the protection. No doubt the protection in the "Barfleur" is reduced to 12 inches, but that is a considerable protection. It is a protection against the most dangerous form of projectile, live shell, and I think I am not misinterpreting the views of the majority of the naval profession when I say that they would be content to go to 12 inches if, in accepting armour of that thickness, they could secure a considerable advantage of numbers. Then, if you make the comparison of speed, there is no inferiority in that respect. There remains the question of ability to contend with the sea, the power to keep up speed in all weathers, and the power to fight guns in all those circumstances of weather in which it is likely that a naval action would be fought. Well, undoubtedly, if this is the case, that the "Barfleur" and the "Centurion" are sensibly inferior to the "Royal Sovereign" type in ability to hold the sea and to fight guns in those conditions of weather in which you may reasonably expect a naval action would be carried out; then there is a very serious inferiority, and one which it would be difficult to accept even with a view of gaining in respect of numbers. In respect, however, of the difference in weight of the heavy guns and the thickness of armour, it does seem to me the inferiority is not of sufficient importance to make us hold to the larger type as against the smaller one in view of the great importance of making a gain in respect to numbers. On the whole, I shall hope in the programme of the future, while we shall not throw aside the most powerful types, we shall have a larger proportion of the "Barfleur" class than have found admission into the programme which is now in course of execution. In considering this question of large ships against small ships, it is undoubtedly exceedingly difficult to define what you are talking about when you are speaking of a smaller ship, and what you are talking about when you are speaking of a big ship. Those of us who hold the argument in favour of building a certain proportion of battle-ships of moderate dimensions with a view to a gain in point of numbers have no doubt been very hazy and indefinite in our course of argument, but at last, Mr. White has supplied us with a means of being definite. He seems to me to have produced a type that has immense merits, looking at it as exhibited to us in the

models which we had the advantage of seeing at the Naval Exhibition. I must say I was greatly attracted by the type, and inspired with the conviction that there at least we have found a remarkable expression of our views, when we are asking for the construction of a certain number of ships of moderate dimensions, together with these other large ships, of which he is the author, and which I am sure will be so valuable an addition to the Navy. A great deal has been said about cruisers. In endeavouring to grind down naval opinion into chapters in Naval Annuals, I have found myself following a different course with regard to the cruisers from that which I have followed in endeavouring to interpret the views of the majority of Naval men in relation to battle-ships. When we turn to cruisers, all the arguments seem to me to be in favour of big cruisers, and rather against cruisers of types which have been numerously represented in the Navy, and which seem to be insufficient in size to do the work of scouts to fleets satisfactorily. If a ship cannot keep her speed under all reasonable conditions of weather, and is miserably insufficient in coal endurance, she is useless as a scout for a great fleet. Then we ought to be precise upon this point with regard to dimensions, and I seem to be led to the conclusion that for cruisers for general service we ought not to go below 4,000 tons. There are other services for which we want small vessels, for which inferior dimensions would be sufficient; but it seems to me for cruisers for general service it is undesirable that the architect should be pinched below the limit of 4,000 tons. Immense ingenuity has been displayed in combining great fighting powers with high speeed in less dimensions, but it is a *tour de force*, and I think anything but an economy. I think more money is spent in the intricacies of contrivance in order to get what you want in smaller dimensions than would be sufficient to give you the same things with less effort and more surely if you had only gone to work boldly and accepted the larger dimensions, which are really necessary to get all you require. I was glad to hear Sir Michael Culme-Seymour speak favourably of the powers of our mercantile auxiliaries to do service for the Navy. Of this I am confident, that if they could be spared from the work which they are doing in time of peace to help the Navy in time of war, there are great functions, of looking out, reporting, and gathering information, for which these ships would be exceedingly well adapted. It would be a dislocation of trade to call them in from the work they are doing in help of the defence of the country, but when great emergencies arise, we must accept inconvenience, and it is gratifying to know that besides the force we have in the Navy, which I trust we shall keep on building up so as gradually bring it up to the level of our requirements, there lies a force behind in the trade of the country, which is also of value and would be a most desirable supplement to the regular forces. I shall be, I am confident, interpreting the views of all when I assure Captain Eardley-Wilmot that the Institution is grateful to him for his paper. When it is published and circulated, and reaches the wide audience which it will then reach, it is certain to do a great amount of good, and, as I have said, set people thinking.

Captain EARDLEY-WILMOT: I am gratified to find that on the whole there is a concurrence with the views I have put forward; not that I intended to lay down any arbitrary law, but to enunciate certain points for discussion, so as to get opinions and to hear views on the matter. Admiral Long did not agree with what I said as regards the flag-ship of the squadron being more powerful than the other ships, because he thought it would make it a less homogeneous squadron. I did not mean that the flag-ship should be an entirely different ship in speed and helm-angle, but, looking to the importance of preserving the Commander-in-Chief intact, we might allow a little more weight to his ship. His conning tower, for instance, might be made almost impregnable, for an imperfect conning tower is almost worse than none at all. Then he alluded to the "Rurik," and said we ought to build cruisers to attack and overtake such craft. My view is that the "Centurion" is the answer to the "Rurik." She is built on purpose for distant stations and long cruises, and I believe the "Centurions" of the future will chase the "Ruriks" off the seas. Admiral Colomb truly said that the object of the paper was to stimulate thought and discussion, and that we should build in accordance with general requirements rather than cases of individual ships. Admiral Boys rather doubted the time I gave in which a line-of-battle ship could be built and

sent to sea in the old days. As a matter of fact I over-stated it. In the Crimean War a French line-of-battle ship was built at Brest and sent to sea in 120 days. That is an actual fact. Then as to torpedo effect on ships, Admiral Boys thought the large ship would come off better than the small ship. I do not think so. It is very much easier to add to the power of the torpedo than to add to the ship's defence, by increasing her size, against the torpedo. Then as regards the "Blanco Encalada," he said that was an exceptional case; there was great neglect in the look-out. Now, you cannot take these cases and say, "If this had occurred and that had occurred it would have been thus." You must take actual facts, and I have no doubt in the next war there will be just as many cases of carelessness as the case of the "Blanco Encalada." At Lissa you might have said that it was an extraordinary thing that the "Re d'Italia" had stopped her engines and was actually stationary at the time she was rammed. As a matter of fact, she was. She had gone ahead and then astern, and she was stationary at the moment that the "Ferdinand Max" ran into her. Captain May considers that the big ships will stand blockading work better than those of smaller dimensions. I do not think that follows at all. A ship can be built of 9,000 or 10,000 tons which can perform this service just as well as one of 14,000 tons. If you take actual ships of 9,000 tons, the "Hercules" or the "Sultan," they are perhaps more suited for this particular work than the more recent types. Of course, it is quite true to say that speed is more easily maintained by large ships, but in the "Admiral" class they can get excellent speed in a moderate ship. Take the "Collingwood," a ship of 9,500 tons. She had an exceptional speed over any vessel that had gone before her. As regards the "Centurion" not being able to compete with the "Royal Sovereign" in battle, it is impossible to argue on that point. I have no doubt most Officers would be ready to take the "Centurion" into action against the "Royal Sovereign" if necessary, as in the old days the two-decker successfully coped with the three-decker. I was very glad indeed that Mr. White did me the honour to come this afternoon and make some remarks on my paper. He considered it was rather a left-handed procedure fixing the displacement before laying down what the attributes or the qualities of ships should be. I rather thought that I had followed this latter course. I took the "Centurion" and the "Barfleur," and referred to their qualities *seriatim*—armament, protection, speed—and said that in each case it was sufficient, that we did not want more, and the result was a ship of 10,500 tons. Lord Brassey has alluded to the numbers we want. Our requirements are not the same as those of other nations. Other nations may be strong in one point only, but we have to be strong all over the world, and to ensure it we must have a large number of ships. No nation can afford to build many battleships of 14,000 tons. Then why should we stop at 14,000? Why not go to 20,000 tons? You can have a much more powerful ship of 20,000 tons than the one of 14,000 tons. Where is the limit to be? We must draw the line somewhere. I was very glad, indeed, to find that an Admiral, who has lately been in command of a squadron, did agree with what I said as to size, because he has had actual experience of these ships of moderate dimensions in all weathers. Therefore any views of that sort are very valuable indeed. What he said about cruisers no doubt is perfectly true. We want fast vessels and ability to keep the sea for a length of time, which is entirely dependent on coal. I think most people will agree that until recently many of our cruisers were over-weighted with guns, and I think it has come about in this way. The old 32-pr. shot had a calibre of 6 ins., and we desired to perpetuate that. But the 6-inch gun of to-day is not the 32-pr. of the past. It is about double the weight. In cruisers gun power must be sacrificed to speed. It was a great gratification to me that Lord Brassey should kindly have consented to preside this afternoon. His multifarious engagements do not often permit him to indulge in a little recreation of this sort. Therefore, I cannot conclude without expressing my thanks to Lord Brassey—and I am quite sure you will join in this expression—for his kindness in coming and taking the chair this afternoon, and giving us the benefit of his valuable opinions.

DESCRIPTION OF THE "NAVIGATION SECTION," ROYAL NAVAL EXHIBITION, 1891.

By Captain HENRY H. WASHINGTON, R.N., Hon. Secretary, Navigation Committee, Royal Naval Exhibition.

"It is on the Navy under the good providence of God that our wealth, prosperity, and peace depend."

THIS motto, which was adopted from the preamble to the Naval Discipline Act, better known as the Articles of War, was adopted by the Royal Naval Exhibition, which opened under Royal patronage in May, 1891.

The object intended was to convey to the general observer some conception of the rise and progress of the Navy, and to illustrate the naval history of the nation from its earliest existence by presenting to the public a complete chronological series of loan and trade exhibits of naval and maritime matter, the initial idea being to present not only the present condition of the Navy, but the steps by which that condition has been reached.

It was with this object in view that chairmen were elected and sub-committees formed of energetic naval Officers and scientific gentlemen to carry this into effect, and it was owing to the hearty good will, loyal co-operation, good judgment, and intelligence of all concerned that this was so successfully accomplished, being a singular proof of the power which lies in the naval Officer of dealing with the unexpected when he meets with it.

The thanks of the Navigation Committee are due not only to public departments and private firms, but especially to the following: the Lords Commissioners of the Admiralty, the Council of the Royal United Service Institution, the President of the Royal Naval College and the Royal Observatory at Greenwich, the Corporation of the Trinity House, and the Council of the Meteorological Society, for their zealous co-operation and assistance, and to all those scientific gentlemen who contributed interesting loans.

The Exhibition was divided into four main sections:—Arts, Navigation, Models, Ordnance.

It is proposed to deal with the Navigation Section, which included all the exhibits in the Franklin and Cook Galleries, and sub-divided as follows:—(*a*) Arctic; (*b*) Signals; (*c*) Lights, Buoys, and Beacons; (*d*) Marine Meteorology; (*e*) Hydrography; (*f*) Compasses; (*g*) Navigating Instruments.

I must here acknowledge that I am indebted for information on navigation to several members of the United Service Institution who have spoken on the subject.

a. *Arctic.—The Franklin Gallery.*

On entering the gates of the Exhibition from the main entrance, this gallery is seen on the left hand, its name being very appropriately chosen in memory of the distinguished Arctic explorer, Sir John Franklin, K.H. It contains the Arctic sub-division of the Navigation Section, being an exhibit of all the appliances used in Arctic navigation, many of them having been actually in use in those regions.

Many interesting relics illustrative of the history of Arctic research are displayed in this section, and especial attention should be given to the touching and unique remains of the Franklin Expedition.

The following remarks are taken from the "Story of the Franklin Search," which is told in the most touching and thrilling manner by Lady McClintock.

The subject of Arctic discovery early engaged the attention of Englishmen; King Alfred the Great wrote about it some years ago.

The dream of our fathers was to discover the North-West Passage to China and India round North America through the Arctic Region by sea. This passage has been found to exist, but so blocked by ice as to be impracticable, and the discoverers "forged the last link with their lives." When the great Canadian highway was opened in 1885, England clasped her girdle round the world, thereby completing the circuit of the world under our flag.

The first object met with is a full-sized representation of the cairn erected by the crews of the "Erebus" and the "Terror," belonging to the Franklin Expedition which left England in June, 1845, on Victory Point, lat. 69° 37′ 42″ N. and long. 98° 4′ W. In this cairn they placed their record dated April, 1848, which was found eleven years later (1859) by Sir Leopold McClintock, this record being the only written information we have ever received of them.

In the central space beyond the cairn, the relics recovered from the lost expedition, including the record, were arranged in glass cases upon a large table. They consisted of a miscellaneous collection, everything, in fact, which an expedition of the kind might leave behind. These objects were all catalogued at length in the Official Guide.

In the centre stood a trophy of fourteen flags, all being banners carried by sledges employed in the Franklin search.

The remaining central space of the gallery was occupied by a representation of an ice-field or floe, on which was exhibited in realistic form the mode of sledge travelling adopted in our Arctic expeditions; the figures were all rigged out with snow goggles, cavernous mittens, and other articles essential to such high latitudes, whilst the encampment was represented by the interior of a tent with the weary inmates in their duffle sleeping suits, the whole tableau forming a worthy illustration of the means by which British seamen have discovered and explored many miles of frozen shores otherwise inaccessible.

The left wall was covered with polar charts and cartoons of Arctic

and Antarctic scenery, and on either side of the gallery were exhibited portraits of Arctic explorers, beginning with Sir Hugh Willoughby, who perished with all his crew in 1554, and continuing down to Cook, Parry, Franklin, and Officers of our own day, whilst from the roof was suspended a balloon similar to those used in the Franklin research, 1852–53. Bundles of printed papers, describing where relief ships and depôts of provisions could be found, were attached to an ignited slow match which trailed from the balloon, and were thus by degrees set free to be scattered by the wind in hopes that some survivor might find them. It was a clever invention as a means of conveying communications across vast tracts of snow when any other means would fail.

In a large glass case on the right of the gallery were shown the sledge banners used by the North Polar Expedition under Sir George Nares, K.C.B., including the Union Jack which they carried beyond the furthest north point which had been previously attained, viz., lat. 83° 20′ 26″, Markham.

On either side were counters upon which were exhibited many articles of interest, such as Arctic birds and animals, and Antarctic birds, Esquimaux implements, kayaks, and curiosities, Greenland woodcuts; Arctic and Antarctic sketches and paintings, especially those of Beechey, Inglefield, and May; geological specimens, meteorological instruments used in these regions; whilst high above the portraits were numerous heads and horns of Arctic animals. The silver model of the steam yacht "Fox," in which Sir Leopold M'Clintock discovered and brought home the "Franklin Record," completes the description of this gallery; and I may here notice the iceberg model, which is illustrative of life in the Arctic regions, and which stood in the grounds of the Exhibition. It represents the "Investigator," Captain McClure, R.N., "nipped in the ice." It was by means of the sledge parties of this ship that the greatest discovery of the century was made, namely, the existence of the North-West Passage, and which recalls the words of General Charles Gordon to mind, viz., "England was made by her adventurers."

Cook Gallery.

Continuing our route through the Arts and Relics Section, and ascending the stairs at the end of the Howe Gallery, we reach the Cook Gallery, being very appropriately chosen in memory of the greatest of English navigators, Captain James Cook, F.R.S. It contains all the appliances in connection with the art, science, or handicraft of navigation, and is devoted to all the exhibits of this section.

In some respects this is a section apart from others, as it is devoted to arts of peace instead of implements of war, and its international character is symbolized by being decorated with flags of foreign nations bearing the names of great maritime navigators and explorers thereon, such as La Pérouse, Vasco de Gama, Columbus, Behaim.

A famous American writer says, "A few years after the peace of 1763 the great navigator Cook began his memorable series of voyages, and surveyed strange lands, barbarous, which, after a time, were transformed into other Englands, vigorous children of this great mother of nations."

Sir William Thomson says that "Navigation" means finding a ship's place at sea and of directing her course for the purpose of reaching a desired place. It consists of three modes:—1st, pilotage; 2nd, astronomical navigation; 3rd, dead reckoning and sounding.

The history of navigation (Markham) consists chiefly of the stories of the search for longitude, the discoveries of the properties of the magnet, of the conversion of the old portaloni into our almost perfect modern charts.

The manner in which sailors of old navigated their ships from port to port in safety has always been a marvel to modern seamen.

In the Viking days hawks and ravens were carried, and in case of doubt the birds were let loose and, winging their way to the nearest land, guided thither the bewildered mariners.

The craft of lodesman or leadsman was the introduction of specialism into seafaring life. The compass, which was first used by the Chinese in time of remote antiquity, was probably introduced about the 13th century, before which the Pole-star had been their principal guide. In the early time of navigation globes became a part of the scientific furniture of every well-equipped ship. These were followed by books on navigation. Later on the ancient mariner guided his ricketty craft by three L's—log, lead, and look-out; when certain astronomical data became available, another L—latitude—was added. In the present day this regiment of L's is augmented by a fifth and very important comrade, namely, longitude. The early charts and sailing directions combined were quaint and curious productions. Nevertheless, the explorer probably relied on dead reckoning (course steered and distance run); much also was left to guess work. The history of instruments, from the astrolabe to the sextant, the map on Mercator's projection, discovery of variation of the compass by Columbus, and of logarithms by Lord Napier, all led by degrees to the "Nautical Almanac," and the marvellous self-recording log, sounding machines, &c., of the present day. It is to such instruments that we are indebted for the security of navigation, and the reduced casualties and disasters at sea in modern times, all of which make the voyage by sea still a possibility.

b. *Signals* (including Lights and Signals for Preventing Collisions).

"Light, more light" is the cry of the anxious skipper when feeling his way up Channel with every two craft in three flitting by with scarce a glimmer. Put off the pilot and then douse the glim seems to be the unwritten law of people who will risk valuable cargoes and priceless lives in order to save sixpennyworth of oil.

This sub-division is not large, as the apparatus employed is not

subject to much change. On the left is shown a series of lights and fog signals (Admiralty) used in the Royal Navy, and opposite, on the right, are the trade exhibits of Messrs. Nunn, Harvie, Ridsdale, Holmes, Chance, which are so well known that they hardly need a word.

"The lamp with a thousand rays" is the name of a genuine article. It is the Paragon Double Reflector Lamp of Captain Loftus, Siamese Navy. It is a circular and parabolic curved light.

In the centre, Messrs. Pain and Sons had a very artistically arranged pyrotechnic exhibit. He also contributed to the entertainments by his very successful firework display in the grounds. His neighbour, Messrs. Wolff, of Southampton, exhibited a brilliant display of national, naval, and yacht flags. The making of flags was also shown.

He also kindly furnished the flags of foreign countries, emblazoned with names of great navigators, which adorn this gallery.

Admiral Colomb says, the whole of this group of anti-collision lights is the growth of forty years' invention. From the earliest time until 1848, when vessels approached one another at night, two white lights in lanterns were shown vertically on the port or left side, or a single white light on her starboard or right side. About 1848, steamers carried permanently the white light at mast head with a red light on left side, and a green light on right side. Then came steam whistles, fog horns, ringing of bells, beating drums, guns, &c., for denoting the presence of ships during fog; anchor lights.

In signalling proper between ships at sea, progress is best illustrated by the group of Signal Books of 17th century in Charles II's time, from the code used by the Duke of York down to the inventions of Admiral Colomb.

Signals were made in daytime by means of coloured flags, and at night by groups of white lights in different forms. It reached its highest development at the hands of Sir Home Popham in 1816. It was from an edition of this book, in 1803, that Nelson's celebrated signal was made.

The semaphore is now largely used instead of flags in daytime, and was in existence half a century before being adopted afloat in the Service. Mr. Redl, an Austrian gentleman, was the first to conceive, forty years ago, the idea of a signal system which might be nearly uniform in daylight, by night, and in fog. This is represented by our present flashing system.

c. *Lights, Buoys, and Beacons.*

This sub-division is headed by the full-sized model of the Eddystone Lighthouse in the grounds of the Exhibition. The Eiffel Tower as it were of the Naval Exhibition was designed by Sir Jas. Douglas, F.R.S., and built by Mr. D. Charteris. It is precisely similar to the original structure. The height is about 170 feet to top of the lantern, and surrounded by a gallery from which a beautiful bird's eye view was obtained. Nearly 100 tons of iron and steel were

employed in its construction, which was covered with Portland cement on a steel lathing, and painted to resemble stone. It was finally attached to strong anchor plates and embedded in cement concrete, thus ensuring its stability. An hydraulic lift was provided by which visitors could ascend to the top of the platform, and send messages to their friends by means of specially prepared post-cards. The light, which is far more powerful than the actual one of oil, is termed Double Group Flashing, Dioptric Light of the Fourth Order, and was composed of Messrs. Chance's refracting lenses only, and arranged for an electric arc light, the current of which was 500 ampères and 60 volts, producing a light equal to 5,000,000 candles, the most powerful light in the world. The light revolved every 30 seconds, the two flashes being separated by an interval of 4 seconds, and the group by an interval of 21 seconds. The revolving apparatus by Kenward Hopkinson Type. In comparison with this marvellous development is shown the original "cressett" or grate for a beacon light in the year 1680, in which a coal fire was burned every night from sunset to sunrise, and which in the early days of navigation warned the navigator of his approach to St. Agnes, in the Scilly Islands.

It is interesting to compare this also with Trotter's automatic light, and Chance's harbour occulting white light occasionally shown red.

The great gas and bell buoy, containing sufficient for two months when alight, was another development enabling the navigator to thread his thread his way through intricate channels at night and in fog.

Models of all the existing appliances for lighting and buoying channels, marking dangers, &c., are shown, as also a large chart illustrating the system of buoying channels. In this particular, the Exhibition is indebted to the kindness and exertions of the Elder Brethren of the Trinity House, assisted by the Commissioners of Northern Lights, for the interesting display of models of lighthouses from the first Eddystone of Winstanley down to the present day.

The history of modern lighthouses commences with the Cordonan Tower in the Bay of Biscay, 1611, and next comes the Eddystone.

The "Eddystone" story, although told so often before, deserves repeating.

The first structure, shown in the model was built by Winstanley, of Essex, in 1694, and destroyed by the great storm in 1703, when the brave and devoted constructor with workmen and keepers perished. The second structure shown in the model was built of wood by Mr. Rudyerd, a silk mercer, of Ludgate Hill, in 1708. It was destroyed accidentally by fire in 1755, when the keepers were rescued. The third structure was built of stone by John Smeaton, F.R.S., in 1759. Candles were superseded by oil lamps, and reflectors in 1810, and a lenticular apparatus adopted 1845. The lenticular system was introduced by Monsieur Fresnel in 1819. An original model of Smeaton's Eddystone, made by himself, was also exhibited.

The fourth and present structure was built on a portion of rock eastward on account of the gneiss rock of Smeaton's tower having

become seriously damaged by the sea. It was designed by Sir Jas. Douglas, F.R.S., and completed in 1881, the first and last stone being laid by H.R.H. the Duke of Edinburgh. The light is lenticular.

The ancient Pharos, which shone upon many a Roman galley, A.D. 53.—This tower is now standing within the Castle Yard at Dover, and is mentioned by early writers as the remains of a Roman Pharos.

Nore and Dudgeon Lightship, 1731–36.—This model represents the first lightship moored on the English coast for guidance of mariners.

St. Catherine Lighthouse.—Originally established in 1780. Furnished with electric light in 1888. It is believed to be the most powerful electric light in the world.

Commissioners of Northern Lights: Bell Rock Lighthouse, built by Robert Stevenson, F.R.S.E., F.G.S., &c., in 1811. Now the oldest rock lighthouse tower in the world.

Hyper-radiant lens of 1,330 mm., suggested by Messrs. Stevenson in 1869, and made in 1885, was tested at South Foreland and found to be the most efficient lighting apparatus yet made, and adopted since both at home and abroad.

This exhibit of the Eddystone model was the means of furnishing the idea for the opening ceremony of the R.N.E.

H.R.H. the Princess of Wales, who unlocked and opened the door of the miniature model lighthouse, which operation caused a brilliant light to appear in the lantern and unfurled a small flag at the summit; simultaneously a gun was fired, and the Royal Standard hoisted at the top of the full-sized model in the grounds, as an announcement that the Exhibition was opened.

Hopkinson's triple-flashing light is the letter S of the Morse-Colomb flashing alphabet. The collier skipper would ask: "Bill, was that a S or a J, or a H or a E?" Bill, if he was well up, would reply: "Captain, them is things as no fellow can understand."

d. *Marine Meteorology.*

In this sub-division the main points of the science are fully illustrated by charts exhibiting the movements of air and water. There are also charts displaying the varying atmospheric pressure and temperature of the sea surface. The actual monthly current charts are entirely novel, none such having been before attempted.

The daily weather charts of the British Isles were also shown, and the Meteorological Office kindly undertook to change them regularly whilst the Exhibition remained open.

Perhaps the most attractive feature in this section was the ingenious contrivance of Mr. Clayden, F.R.M.S., whose moving and realistic models of "Ocean Currents," whereby the "winds and currents were reduced to rule, if not to obedience."

No. 1. Working model, showing the Gulf Stream and other great currents in the Atlantic.

No. 2. Working model, showing the currents of the Indian Ocean and change of monsoon.

It consists of a flat, wooden tray, covered at bottom with map of the Atlantic on Mercator's projection, with the land and sea represented by filling the part which represents the ocean with water, and the land masses cut out of wood.

Air is forced into a box by a foot blower, and, issuing from a series of tubes, represents the prevailing winds. The movement of the water is shown by floating particles of lycopodium powder. The motion is entirely produced by jets of air impinging on the water, and arranged so as to imitate roughly the average direction of the wind.

e. *Hydrography.*

This sub-division embraces a series of charts, from the earliest extant to one of the present day, in process of preparation by the engraver, which are exhibited by the Hydrographic Department of the Admiralty.

Also a chronological exhibit of time-keepers, with a collection of various surveying instruments, sailing directions, and deep-sea sounding machines.

Hydrography first assumed a definite form in 1417. Two hundred years after the discovery of the compass, Prince Henry of Portugal founded an academy for pilots and mathematicians at Sagres, with Marstro Jaque as president. Instruction was given in use of astrolabe and method of finding latitude by altitude of sun, having previously constructed tables of declination.

Mr. Clements Markam, C.B., F.R.S., in his very interesting paper on Naval Science, tells us that "an acquaintance with the thirty-three editions of Ptolemy, from 1472 to 1572, with their "Tabulæ Novæ" is a foundation of the knowledge of the history of chart making. These were superseded by the portolani, or compass charts, the most important contribution to cartography of the Middle Ages. The name portolano originally meant a book of courses or sailing directions.

As early as 1311, charts of the Mediterranean were drawn for navigators which were nearly correct. Portolani charts were drawn for practical purposes, and were usually on parchment, and richly ornamented in gold and colour (1497 to 1556).

A very fine example drawn by Freducci, of Ancona, dated 1555, was exhibited by Lieutenant Hamilton, R.N.

In 1541, Mercator first made a name by his famous globe at Antwerp, and after many adventures he published his famous chart of the world at Dinsburg in 1569, but the true principles of Mercator's chart were not demonstrated till half a century later, by Wright, of Cambridge.

The "spiegel" or mirror charts of the Dutch, which were published in 1584, 1595, were translated into English by Ashley, and were the basis on which our own charts were constructed in the 17th and 18th centuries.

Since the time of Captain Hurd, the first Naval Hydrographer, our charts have been adapted to the requirements; and as regards clearness and accuracy I believe they are nearly perfection.

An acquaintance with the series of maps from the days of Ptolemy, following on the course of discovery with the portolani of Italy, the "spiegel" of Holland, and the Neptunes of France, with the earlier work of Grenville Collins and his successors in England, and with the later developments of our hydrographers, forms the previous history of chart drawing.

Amongst the most interesting was a chart (lent by the Marquis of Salisbury) made by Captain Burrough, of H.M. Fleet, in Queen Elizabeth's time, dated 1588, of the entrance to the Thames; also a chart (lent by his Grace the Duke of Leeds) showing the track of Sir Francis Drake's squadron to the West Indies and back, 1585; old and modern surveys at different periods from 1681 to 1890; several charts of Cook's survey, 1765–68–70–80; chart of the world, showing oceanic depths, 4,550 to 4,650, in the Pacific Ocean; a collection of portolani charts, 1530, showing Magellan's track, 1519–22; a portolano map of the world, 1555; the "Mariner's Mirrour," 1588; the "Lightening or Sea Mirrour," 1670, with instructions for showing cross staff and astrolabe; a sea atlas, by John Sellar, Hydrographer to the King, 1675; Johnstone's "Royal Atlas of Modern Geography."

The process of engraving charts on copper plates was demonstrated by an engraver at work belonging to the Hydrographic Department.

Here is also a complete collection of the various instruments used in surveying, being part of the equipment of H.M. surveying ships, from a theodolite to a deep-sea thermometer.

In this sub-division are shown specimens illustrating the gradual development of the chronometer, by a chronological exhibit of timekeepers from the Royal Observatory, Greenwich. Here may be found the timekeeper which gained for Harrison, the inventor, a reward of 20,000*l.*

In the year 1714 Sir Isaac Newton mentioned various schemes to the House of Commons for finding longitude at sea, and a reward was offered of 20,000*l.* for a determination of the longitude to within 30 geographical miles. John Harrison, whose invention gained the 20,000*l.*, was a native of Yorkshire, and by trade a carpenter. In 1735 he settled in London, and devoted himself to horology. He died in 1776. His invention was tested in 1761 on a voyage to the West Indies, and on arrival at Jamaica, at Port Royal, the longitude of that place as shown by the watch only differed 5 seconds (about 1 nautical mile) from the truth. In this department may be also seen the best handiwork of Dent, Arnold, Poole, Kuhlberg, Kendall, and others. Mr. E. J. Dent constructed the Westminster clock. He was born in 1790, and died in 1853.

In sounding machines, amongst the most important are Lucas's automatic sounding machine, and various patterns of gear in connection with deep-sea sounding operations, from the deep-sea sounding lead to Thomson's sounding instrument, and James's "Marine

Sentry," "an automatic shoal indicator," to Massey's sounding machine. The common deep-sea lead and line is the most simple, the most reliable, and probably the most ancient, instrument of navigation.

f. *Compasses, Astrolabes, &c.* g. *Nautical Instruments, Books, &c., used in Navigation.*

Still passing on, we come to a little side chamber just opposite Gordon House, where are exhibited compasses, astrolabes, cross staves, &c., and other instruments of torture. The history of the compass is made visible in this sub-division, from the suspended magnet and loadstone down to the beautiful perfection of Sir William Thomson or the Admiralty compass. It was first used by the Chinese in times of remote antiquity, and by Mediterranean seamen in the 13th century. The discovery of variation and of dip with the phenomena of terrestrial magnetism is also part of the subject, and the discovery of the variation of the compass by Columbus was a memorable epoch. Here I am indebted to Mr. Clements Markham. The most ancient nautical instrument known to us was the astrolabe, in the 14th century. It was first adapted for use at sea by Martin Behaim, of Nuremberg. It was difficult to use at sea, and Vasco de Gama found it necessary to go on shore before he could find his latitude with one. Magellan used them in 1519, and was supplied with seven astrolabes and twenty-one quadrants. Sir Robert Dudley, a distinguished Officer in Queen Elizabeth's time, invented one in 1596. The cross staff, by Werner, of Nuremberg, in 1514, succeeded the astrolabe. It was most cumbrous, and required at least two assistants. The back staff or Davis quadrant, a later instrument, was the invention of John Davis, the Arctic explorer, and was in use in 1740. In 1653 William Oughtred invented the horological ring. In 1730 John Hadley constructed the first reflecting quadrant, which became a sextant by the extension of the arc in 1757. Globes were in the early times of navigation the chief vehicle of instruction, and became a part of the scientific furniture of every well-equipped ship. Sir Martin Frobisher, in his expedition of 1576, used one, as well as a *sphæra nautica*. Globes were followed by books on navigation, chiefly Spanish works of Cortes and Medina. In the reign of Elizabeth English works followed. For instance, "The Regiment of the Sea" was the first English book on navigation, by William Bourne, 1577, wherein is described the use of the log and system of marking it, as well as how to use the cross staff and astrolabe; and the most recent being "Raper's Navigation," nineteen editions being published from 1840 to 1891.

The first Nautical Almanac of Maskelyne made its appearance in 1769. Previous to this time the Ephemerides of Regiomontanus in the 15th century, and in the reign of James I that of Origanus and Searle; an interesting collection of these books was exhibited, as well as the instrument called a log, by which the speed of a ship through the water is measured. The common log and line have probably been

in use for more than three centuries. Massey's Patent Log is a clever invention since 1808.

Amongst the trade exhibits in this section may be noticed those of Hughes and Son, Cary and Co., Dent and Co., Steward, and the electrical log of Granville, exhibited by Messrs. Elliott Brothers.

Sir William Thomson's compass and sounding machine were exhibited by Messrs. White, of Glasgow.

Specimens of all these instruments were exhibited, especially the following:—Chinese and Japanese compasses, by the Hartley Institute, Southampton; binnacle and azimuth compasses, by the Admiralty; Earl of Caithness's compass, Barlow's correcting plate, 1823, and a diagram illustrating the magnetism of iron ships, by Captain Mayes, R.N.; the Earl of Morton exhibited a compass, sun dial, and astrolabe, of 1590: also a Persian astrolabe, by the Royal United Service Institution, and various others; a Davis quadrant or back staff, down to the sextant used by Captain Fitzroy, R.N., in H.M.S. "Beagle," in 1831–36.

Captain Hull says: "A practical sailor uses compass and sextant together. The pilot marries the sextant and compass together, and so obtains a numerous progeny of reliable positions. The sailor looks upon his sextant as a good sportsman does upon his gun. The compass is his dog, and points; the sextant is his gun, and brings down."

NAMES OF MEMBERS who joined the Institution between the 1st April and the 30th June, 1892.

LIFE MEMBERS.

Elliot, Walter E., Lieut. R.N.
Wright, Philip N., Lieut. R.N.
Gibbons, Frederick K. C., Lieut. R.N.
Dawkins, J. W. G., Capt. R.A.
Rew, A. R. C., Lieut. N. Staff. Regt.
Montgomery, H. M. de F., Lieut. R.A.
Farquhar, Arthur M., Commr. R.N.
Young, J. R., Lieut. R.E.
Walter, R. L., Capt. 7th Hussars.
Barter, C. St. L., Major Yorks L.I.
Mason, J. F., Capt. Oxf. Yeo. Cav.
Foakes, E. T., Capt. 3rd Bn. Worc. Regt.
Ryan, Frank E. C., Lieut. R.N.
Banon, F. L., Capt. Shrops. L.I.
Bellairs, N. E. B., Lieut. R.A.
Long, Bernard, Sub-Lieut. R.N.

ANNUAL SUBSCRIBERS.

Whitehill, S. J. K., Gen. Ind. Staff Corps.
Whitehill, C. S. S., Major K. O. Yorks L.I.
Elliot, G. C., Lieut. 3rd Bn. Rl. High'rs.
Haldane, J. A. L., Lieut. 2nd Bn. Gord. High'rs.
Edye, L., Major R.M.L.I.
Gordon, F., Capt. 2nd Bn. Gord. High'rs.
Charrier, P. A., Lieut. R. Mun. Fus.
Payne, H. C. B., Lieut. N. Staff. Regt.
Smith, Edmund H., Lieut. R.N.
Cave, C. D., Major Staff. Regt.
Waller, E. H., Lieut. 1st Bn. R. Fus.
Somerville, A. A., Capt. 4th V.B. Oxf. L.I.
Bacon, Reginald H. S., Lieut. R.N.
Nelson, H. S., Capt. R.A.
Blake, Herbert A., Lieut. R.N.R.
Oswald, W. A., Lieut. Ind. S.C.
Mumby, C., Col. 3rd V.B. Hampshire Regt.
Hornby, Sir Geoffrey T. P., G.C.B., Adm. of the Fleet, A.D.C. to the Queen.
Wemyss, F. C., Col. 3rd Bn. W. Rid. Regt.
Rhodes, E., D.S.O., Capt. Rl. Berks Regt.
Hughes, C. F., Col. Ind. S.C.
Hanbury-Tracy, E. T. H., Lieut. Colds. Gds.
Rawlinson, H. S., Capt. K.R.R. Corps.
Sanderson, J. C., Capt. Hon. Arty. Company.
Bayly, W. H., Col. Rl. W. Kent Regt.
Groves, J. Percy, Lt.-Col. Rl. Guernsey Arty.
Stisted, C. H., Capt. Rl. Scots (Loth. Regt.).
Maunsell, G. W., Capt. Rl. W. Kent Regt.
Fyler, A. E., Col. late Rl. W. Kent Regt.
Williams, A. H. W., Maj.-Gen. R.A.

FOREIGN SECTION.

THIS portion of the Number, hitherto the Occasional Notes, has now become the Foreign Section, and is reserved for articles, either original or compiled, on professional subjects connected with Foreign Naval and Military matters; also for notices of Professional Books, either Foreign or English.

The Council of the Institution wish that this section shall be developed still further, and I have undertaken to continue my Editorship during the current year, with a view of aiding them in carrying out this work. It seems to me possible to make this section, and consequently the Journal, the means of keeping our Members acquainted with all naval and military progress abroad *pari passu* with that progress; and I shall be glad to receive from members of both Services, including in the latter those of the Auxiliary Forces, suggestions, information, or offers of assistance.

It is desirable, further, that I should state that, as regards editing the Naval matter in the Section, I shall have the aid of Naval Officers, thoroughly competent to give good advice and to pronounce sound opinions.

It must, however, be borne in mind that, as the change from a quarterly to a monthly issue has been made in order to ensure the more prompt publication of the Lectures after their delivery than has hitherto been the case, the Foreign Section will, as a rule, be restricted in extent during the Lecture season in the first half of the year, and will be prominent in the second half.

It is requested that communications and books for review (the latter under cover to the Librarian) may be addressed to me at the Royal United Service Institution, Whitehall Yard, London, S.W.

LONSDALE HALE,
Colonel R.E. ret.

THE LAGOS EXPEDITIONARY FORCE IN WEST AFRICA.

By Captain Hon. A. S. Hardinge, the Royal Scots Fusiliers.

In the subjugation of the King of the Jebus and the overthrow of his capital, Jebu Odi, a blow has been struck on the West Coast of Africa, which may be expected to have a lasting and beneficial effect in the overawing of the natives with the power of our rule.

It should also, without doubt, exercise a wide-spread influence in deterring the multitudinous tribes, resident along that coast, from again resisting our authority.

For the last twenty years complications have arisen between successive Governors of the Colony of Lagos and the Kings of Jebu, anent undue taxation, and ultimately the complete blockade of trade passing through their territories.

Situated as it is, the Colony of Lagos may be fairly said to be wholly dependent for its supply of trade, and thereby its revenue, on the Jebu territories, since all the big trade routes from Ibadan and the interior converge by Saargemu and Jebu Odi to the Lagoon, and thence to Lagos.

From time to time palaver has succeeded palaver, promises and treaties have been signed only to be broken as soon as made. The closing of the trade routes has perplexed the minds of more than one Governor.

The Ibadans, a strong and warlike tribe, situate to the north of the Jebu territories, feeling the want of an outlet for their trade, and finding the routes to the Lagoon closed to them, have from time to time volunteered to take the law into their own hands, and settle their differences with the Jebus. They, however, have only been deterred from carrying this project into effect by our repeated assurance that we would coerce the Jebus by soft words and European diplomacy. Lastly, we had recourse to offering them a tribute of 500*l.* per annum, which offer, however, was indignantly refused.

Meanwhile the all-powerful Chamber of Commerce in Liverpool, represented by merchants of vast wealth and interests, began to be alarmed at the growing decrease of trade available from their habitual resources. This trade consists chiefly in an interchange of ivory, indigo, palm oil, and kola nut for many coloured clothes and spirits. This palm oil forms one of the principal commodities of import in the vast commercial metropolis of the north.

No sooner had the shoe begun to pinch in Liverpool, and commercial interests were at stake, than the Colonial Office decided that stringent measures of a more decisive kind than had hitherto been resorted to were necessary for opening up the trade routes. The

War Office was conferred with, and it was deemed sufficient by the authorities to rely solely on the local forces, as the climatic influences have such a deleterious effect on Europeans.

The Adjutant-General, Sir Redvers Buller, with his world-wide experience, however, decided upon sending out six Special Service Officers to form a stiffening to the native levies. He also appreciated the necessity of having one Officer for the control of every thirty men in bush warfare.

These Officers, owing to the proximity of the rainy season, during which operations were held to be impracticable, were despatched at three days' notice. They arrived after three weeks' sea voyage to find the expedition standing still, awaiting the arrival of 100 West Indian troops from Sierra Leone.

This delay, though wearisome and irksome at the outset, was perhaps productive of good, as the proverbial lethargy and apathy inherent in those resident on the West Coast was too apparent here.

No preparations had been made for an immediate advance, the Gold Coast constabulary had arrived, and Colonel Scott, C.B., an Officer of much experience, and who had already seen much service, had just taken over command of the expedition. Up to the time of his arrival, however, no corps of carriers had been organized; the guns, their ammunition, mode of transporting them, &c., had not as yet been fixed on, nor had any definite scheme been discussed as to the mode of procedure or order of march during the advance through the enemy's country.

Colonel Scott, however, lost no time in ensuring the ultimate success of the expedition. He issued his orders to the commanders of each unit, and left them to work out the necessary details.

All these minute dispositions were viewed rather in the light of being superfluous, an opinion being prevalent that to wait for the reinforcement of West Indian troops from Sierra Leone was an idea born of ignorance, and that 1 Officer and 50 men was an ample force with which to march through the country to the capital, and thence to summon the King to agree to our terms.

After the lapse of three weeks the West Indian troops arrived, and everything was ready for an immediate advance; even one or two field days had been held to give the Houssas some idea of their conduct on the line of march; they were also practised as much as possible to fire by word of command, and by sections.

Of the 100 men and 3 Officers of the West Indian troops sent down, only 42 men and 1 Officer were fit to proceed to the front; the remainder having already succumbed to fever. These troops cannot be said to be well adapted to bush marching, they require the same rations and commissariat arrangements as European troops. Spats and European shoes are not conducive to great powers of marching when worn by natives; and without possessing the inherent pluck of the white man to struggle and shake it off, they succumb as readily to the ravages of fever as the European.

In a campaign, however, where owing to the conditions of the country, the length of the column, of necessity, varied in proportion

to the amount of transport, such considerations were of primary importance. In this respect the Houssas possess insuperable advantages. Their food is the food of the country. They carry on their person supplies for four days, in addition to their kit and eighty rounds of ammunition. Also, they are quite impervious to any climatic influences.

The column, when in motion, was over a mile in length, and its rate of progress proportionately slow. The route on all sides was surrounded by impenetrable bush, the greater part of which was too thick to allow of flanking parties being detached to act as scouts. There were, however, innumerable by-paths branching off to both flanks, which admitted of the scouting operations being carried out with great success, and thereby the safety of the column ensured. In some parts, however, the track would assume a more open aspect; this was more especially in the vicinity of villages. These open spaces were everywhere in a high state of cultivation. Mealies are here the chief product of the soil, the crops of which were on the point of approaching ripeness. Owing to the great height, viz., 8 to 10 feet, to which these mealies reach when full grown, the view was just as much impeded and facilities for manœuvring quite as difficult as when the track led its tortuous course through the bush.

It can readily be understood how the difficulties of the advance of the column were greatly enhanced by the natural features of the country through which it had to pass; also, how the large proportion of unarmed carriers to fighting men—which necessarily existed—rendered the column vulnerable in a marked degree. This was accentuated by the narrowness of the route, which rarely permitted of more than one man, or at the outside two, to travel abreast.

It was little better than a well worn track, and in parts was much cut up and worn away by the raging torrents which sweep down the inclines during the rains.

There were many impediments, too, to quick progression. Huge trees continually lay across the road, causing gaps in the column, and necessitating continual halts for closing up. Thus the rate of marching exceeded seldom, if ever, a rate of 1 mile per hour. The transport of the guns, more especially the 7-pounders, also hampered the movements of the column. The state of the roads did not admit of their being dragged by hand; they had consequently to be carried piece-meal, each gun, its carriage, and the two wheels being carried separately. These pieces were severally carried, by relays of two carriers at a time, who carried them slung on bamboo cane.

The proportion of unarmed men to fighting men was as follows:—

100 Ibadans, or friendly natives, acting as scouts.
350 Gold Coast and Lagos Houssas.
42 2nd West India Regiment.
3 7-pr. M.L. guns.
2 3-barrel Nordenfelts.
1 Maxim Nordenfelt.

600 Carriers, 250 of which were required for the guns and ammunition.
100 for the carriage of drinking water.
80 for hospital.

The remainder being told off proportionately for Officers' baggage, West Indian Troops and ammunition reserve.

During the day any fears of not encountering opposition were quickly dispelled; as the Jebus did not evacuate their villages without first offering a stout resistance.

On the second day's march the enemy was met in force. They made a determined stand, fighting in high standing mealie fields, and under cover of a hollow road. A sharp fight took place, but at the end of three-quarters of an hour the enemy retired within the walls of an old fort, surrounded by a moat at least 30 ft. deep. The 7-prs. were then brought up, and shelled the place. This was too much for the Jebus, and they retired *pêle-mêle*.

The third day was uneventful; the whole country and all the villages were evacuated for miles. The campaign was thought to be over, and it seemed probable that the Jebus would continue to fly on the advance of the English.

This, however, was only the lull before their final effort. Nine miles to the south of Jebu Odi runs the Yimogyi River. This river is held in highest reverence by the Jebus. It is their great religious or fetish place. The fish are even sacred; and it is here that they offer their sacrifices and appease their gods. During the fourth day's advance, and about half a mile short of this river, the Jebus were met in force. The engagement commenced by the advanced troops being fired on out of the bush while in the act of crossing a shallow tributary of the above-mentioned river. The Maxim was brought up, and its fire, together with the advanced guard of Houssas, compelled the Jebus to retreat.

They continued to retreat until an open space, used as a market place, was reached. Here another stand was made, but the troops behaving coolly and firing well forced the enemy back, and they retired slowly, fighting all the way, on their position in rear of the river.

Along this river they took up a very formidable position. The path leading up to the stream led through a steep and narrow ravine, both sides of which were obscured to view by dense undergrowth. The far bank, on which the Jebus were posted, commanded the approach to the stream; also, owing to the dense background of undergrowth in their rear, their position and movements were completely obscured.

A little to the right of the track the stream made a bend, forming an angle re-entrant towards the enemy; thus the approach was virtually flanked, and that the column did not suffer more, here, during their advance, is simply due to the fact that they were sheltered by the intervening undergrowth and the shelter of the ravine.

The strength of the enemy, judging from the size and number of

huts in their camp at the village of Maybon, and also from the reports of prisoners, must have been between 7,000 and 8,000. They had not only occupied this position but they attacked the column in its entire length.

Buoyed up as they were by superstition, for three hours they made a most determined and resolute stand, sending to their front fresh relays of hundreds of men, whenever either losses or expenditure of ammunition required it; and fighting with a bravery engendered by ignorance and fanaticism combined.

For some time the position of the column was most critical. However, gradually a small contingent was pushed forward through the stream, which with some loss was enabled to reach the opposite bank; their advance being all the time covered by a hot fire from the near bank. The Maxim was also with great difficulty and loss to the gunners brought up, and at last reached the opposite bank. This small force having pushed through and broken the enemy's centre, as it were with a small wedge, reinforcements were enabled to be pushed up to their aid, but the progress was painfully slow, owing to the force being engaged along the entire line of advance.

The firing throughout, as in the generality of bush warfare, was of the wildest description. All the efforts to control the fire were of no avail; the sectional firing, which had been studiously practised, was totally forgotten, and the waste of ammunition was stupendous.

The Maxim throughout did good work, and certainly kept the enemy at bay. The 7-pounders and rocket tubes also kept up a continual blaze, and, doubtless, had a good moral effect.

The bush and undergrowth were so dense on all sides that it was impossible to note the effect of the fire; though afterwards it was found that the losses on the enemy's side were very great.

Meanwhile, though the column during this long and protracted attack had been almost stationary, they had clung on to their position gained on the further bank with the utmost tenacity; and at length the fire of the Jebus appeared to be abating. Now a speedy advance was made to where the country assumed a more open aspect, and within easy reach of where their vast camp was situated.

It was now seen that they had evacuated their camp, leaving their ammunition, provisions, &c., behind them, so precipitate had been their flight. The West Indians were kept in reserve by Colonel Scott during the action, to be used as a final stand-point should the occasion have demanded it.

The Houssas possess a reputation for bravery, second to none, on the coast; and, looking back on the two engagements, it must be acknowledged that this reputation was fully sustained, notwithstanding that in proximity to the river they appeared imbued with the ascendency of the Jebu. Permeated as they are by superstition and fetish customs, every allowance must be made for them; but, nevertheless, their lack of drill, and more especially fire discipline, and the incapacity of their Officers to talk the Houssa language, all tend to detract from their value as a fighting machine.

The night after the battle was spent by the force in a state of mind far from jubilant. True, they had captured the Jebu camp, and the Jebus had taken to precipitate flight; but nothing was known, beyond conjecture, of the extent of their loss. There were also 11 miles still to be traversed before the capital was reached. It was questionable how the force would stand a repetition of the day's attack, and whether the ammunition, under a similar expenditure, would last out. However, on the morrow all fears and doubts were soon put at rest by emissaries arriving with conciliatory messages and flags of truce.

Jebu Odi, the capital, was entered without the exchange of a shot, and the King and all his retinue surrendered. The force remained in Jebu Odi for a fortnight, during which time the Governor of the colony enlightened the King on the resolutions of the Home Government. Flying columns were also sent out along the principal routes leading to the interior, to declare the roads open for trade.

Proofs of the horrors they had perpetrated, in the shape of human sacrifices, were found in all their fetish houses. The remnants of these were all carefully interred, and their fetish houses burned. The King also was informed that such practices would no longer be permitted.

When all was settled the force returned to Lagos, leaving a garrison of 100 Houssas and three European Officers in Jebu Odi. A large flying column also was sent to the westward by the Saargemu route. This column found that the lesson at the Yimogyi River had everywhere made itself felt, and that the chiefs of all the villages came in from far and wide, only too anxious to acquiesce in, and to further any proposals made by the Government of the great Queen.

Thus ended the campaign, the result of which may be said to have been eminently successful, and the cost of which was considerably under 10,000*l.*: a small sum in comparison to the big result obtained. This expenditure may be expected to be soon wiped off by the enormous increase of revenue which must accrue to the colony therefrom.

EXPERIMENTS AT SPANDAU ON 2ND APRIL, 1892, TO ILLUSTRATE THE PENETRATION OF THE 1871-84 11 MM. (0·433-IN.), AND 1888 PATTERN, 8 MM. (0·315-IN.) GERMAN RIFLES.

(From the "Deutsche Militär Artzliche Zeitschrift" of May, 1892.)

THIS course of experiments, which was conducted in presence of a large number of army surgeons, was undertaken at the instigation of the Surgeon-General of the Army.

The experiments were preceded by a lecture by Captain v. Heyking, of the School of Musketry, in which he described certain trials with the 1888 pattern rifle, in so far as they had reference to those about to be undertaken.

The introduction of the smaller calibre, simultaneously with the employment of a new means of propulsion in place of old black powder, had produced considerable increase in the velocity of the bullet, and consequently in its penetrating power. The increased penetration of the smaller calibre bullet, as well as its increased power of preserving its shape on penetration, had also been largely due to the steel coating (envelope).

Captain v. Heyking described how the introduction of this steel coating had been brought about, and how increased penetration had, at the same time, been somewhat accidentally obtained.

Experiments had shown that lead was too soft to take the necessary rifling of the bore, while, at the same time, the latter quickly became fouled.

Trials were made with bullets of various metals which, though harder than lead, were somewhat lighter specifically, such for instance as steel, copper, and brass. At short ranges these gave good results as regards accuracy and penetration, but they quickly lost their velocity. Better results were obtained from wolfram, which is twice as heavy as lead. It was found, however, that this metal could not be obtained in sufficient quantity, and, moreover, it was too dear.

Major Bode now hit upon the idea of using a lead bullet with a coating of a somewhat harder metal. The lead gave the bullet the necessary specific gravity, whilst the coating was to furnish the rotation required for stability. The coating was first made of nickel-plated copper, but this was not sufficiently durable, and a steel coating was tried.

These last bullets were found to be very durable, and, in addition to a low trajectory, had great accuracy and range, and lastly, what was quite unexpected, greatly increased penetration, due to the steel coating.

Whilst the 11 mm. (0·433 in.) lead bullet on striking the target

invariably sets up into a broad, generally mushroom-shaped, or hat-shaped, mass, the 7·9 mm. (0·311 in.) steel-coated bullet does not as a rule lose its shape, or, even if it does so, then very slightly, and, owing to its small diameter, loses relatively very little velocity and power in its passage through the object aimed at.

Captain v. Heyking gave several curious instances of the penetrating powers, &c., of this last bullet.

In the summer of 1891, whilst a company of Würtemberg troops were drilling in one of the barrack rooms, a rifle was accidentally discharged. The bullet passed through the body of one man, through the arm of a second, then through a cupboard, a bedstead, left its mark on the iron bedpost, and finally lodged in the wall.

The man who had been shot through the arm called out "I am hit"; the greater part of the men rushed to his assistance, a few searched for the bullet, while the remainder looked on, amongst the latter the man who had been shot through the body; he did not know that he had been wounded. It was not till after the lapse of several minutes that he cried out, "My God! how weak I feel."

It was only then noticed that he was bleeding freely from the wound of which he died two days later. The incident was related by one of the Officers of the regiment to which the man belonged.

With regard to the experiences of the recent Chilian War, Captain v. Heyking maintains, in spite of the assertion of a high Chilian Officer that the proportion of killed to wounded, as regards the small-bore Männlicher rifle, was as 4 to 1, that the reverse is the case. He referred to the testimony of an expert, whose report went the round of the papers, and in which the author states: "The principal advantages of the Männlicher were, great accuracy at short, medium, and long ranges, wonderful facility for acquiring its manipulation by the soldier, solidity and excellence in construction, its great influence on the 'morale' of the troops, and finally the small proportion of mortally wounded." The wounds caused by the Männlicher are of quite an exceptional nature; they either kill the man outright, or else ensure recovery free from complications or excessive suffering. The bones were clean pierced, even at the greatest distances, without leaving splinters of steel or lead, which usually cause such aggravation of the original wound. The bullets, after extraction, had retained their original shape.

In an engagement at Bandeng, in Africa, where only small-bore rifles were used, it was noticed that several of the blacks, who had been rolled over at a distance of from 200 to 250 m. (220 to 270 yds.), after a time rose, and, holding their hands to their sides or breast, crept away into the undergrowth out of the line of fire.

In the case of a soldier of the Colonial troops who was shot at musketry practice at a range of 250 m. (270 yds.), the bullet passing through the upper part of the upper arm and grazing the bone, the wound healed in eight days, without the formation of matter, under a simple sublimate treatment, and without using more than two cotton-wool compresses, smeared with vaseline, placed on the points of ingress and egress (which latter could scarcely be distinguished

from each other), and secured with a couple of turns of bandage; the compresses were at first changed twice a day, but, after four days, only once a day; the passage of the bullet closed already after four days.

On the 1st May, 1891, in the suppression of the labour riots at Fourmies, and in 1890 at Biala, where the distances were very short, the wounds inflicted were very severe, and for the most part mortal.

The experiments of Professor Bruns, who fired from the Belgian 7·65 mm. (0·301 in.) Mauser rifle, are very interesting. He found that the bullet, even after perforating the strongest bones of the human body, would pass through from four to five men at a range of 100 m. (110 yds.), three to four men at 400 m. (440 yds.), and from two to three men at 800 m. (880 yds.).

He also showed that at ranges above 300 to 400 m. (330 to 440 yds.) the small calibre bullet hardly sets up at all, while between 400 m. (440 yds.) and 1,500 m. (1,640 yds.) the bullet as a rule makes a wound with a very small passage, with very small apertures at the points of ingress and egress, and with very little shattering of the bones, or tearing away of the softer substance. These wounds almost all bear a subcutaneous character, and, since the bullet, or parts of it, seldom or never remain in the body, may be readily healed without the formation of matter. As most infantry battles will be fought between the ranges mentioned above, Professor Bruns has some justification in calling the small calibre rifle a most humane weapon.

The Austrian Army Surgeon, Dr. Habart, arrives at similar conclusions as to the humane character of the small-bore bullet, but is of opinion that infantry fights will often take place at ranges of from 1,200 to 1,800 m. (1,300 to 2,000 yds.). He divides his distances into zones, as follows:—

Up to 500 m. (550 yds.) the zone of "setting up" (explosive action).
500 to 1,200 m. (550 to 1,300 yds.) the zone of the "clean hole through."
1,200 to 1,800 m. (1,300 to 2,000 yds.) the zone of "splitting up and tearing."
1,800 to 2,600 m. (2,000 to 2,850 yds.) the spent bullet zone of "splitting up and tearing."

Somewhat analogous results were obtained by Delorme and Chavasse, Professors at the Veterinary School at Paris, with the Lebel rifle.

The above results are, however, not altogether free from objection, since the results for the longer ranges were not obtained with service charges at these distances, but by so diminishing the powder charge as to get the remaining velocity that the bullet would have at the various ranges with the ordinary service charge. These diminished charges would obviously produce different effects, as regards rotation and rise of temperature, from those which would be produced by

ordinary service charges. The effect on dead bodies would also not be precisely the same as on living men.

It is worthy of note that Dr. Habart also collected statistics with regard to suicides and accidents. He describes how a shot which had come from a firing point 2,300 metres (2,500 yards) distance struck a soldier of the 23rd Rifles, passing through his skull and stony-bone (Felsenbein), that is to say, through the strongest bone of the human frame.

The result of the experiments, carried out partly with the 1871-84 and the 1888 rifles firing at two precisely similar targets, were as follows:—

	1871–84 Rifle. Bullet of toughened lead (70 per cent. lead, 15 per cent. antimony, 15 per cent. tin).	1888 Rifle. Bullet of toughened lead with nickel-plated steel coating (0·0354 in. thick, sides, 0·0158 in. thick).	Lebel Rifle. Bullet of toughened lead with nickel coating.
Calibre	11 mm. (0·433 in.)	7·9 mm. (0·311 in.)	8 mm. (0·314 in.)
Weight of bullet	25 gm. (385·8 gr.)	14·7 gm. (226·9 gr.)	15 gm. (231·5 gr.)
Powder charge	5 gm. (77·16 gr.)	2·75 gm. (42·44 gr.)	2·8 gm. (43·21 gr.)
Velocity of bullet 27 yds. (25 m. from muzzle).	435 m. (1,427 ft.)	620 m. (2,034 ft.)	630 m. (2,067 ft.)

Range 50 *Metres* (55 *Yards*).

1. Trunk of an oak 45 cm. (18 in.) diameter, bullet passed through.
2. Trunk of a fir-tree 52 cm. (20 in.) diameter, bullet passed through.
3. Four oak balks, each 22·5 cm. (9 in.) diameter, five bullets in the third oak balk.
4. Two oak bulks with bad cores, each 30 cm. (12 in.) diameter, bullet passed through.
5. Dung heap 1 m. (39 in.) thick, bullet passed through.
6. Peat soil 1 m. (39 in.) thick, bullet passed through, and did not lose its shape.
7. Layers of sods 1 m. (39 in.) thick, the bullet penetrated 19 in. (49 cm.).
8. Unsifted sand 1 m. (39 in.) thick, the bullet penetrated 28 in. (71 cm.), and did not lose its shape.
9. Sifted sand 1 m. (39 in.) thick:—

(*a*) With the 1871–84 rifle the bullet penetrated 36 cm. (14 in.), and set up into a mushroom shape.
(*b*) With the 1888 rifle the bullet penetrated 52 cm. (20 in.), and did not lose its shape.

10. Wall:—
(*a*) One brick 25 cm. (9·84 in.); (*b*) Two brick 51 cm. (20 in.). With volleys from thirty rifles the walls were shot through—(*a*) at the first volley; (*b*) at the second volley.
11. Iron plate 6 mm. (0·236 in.) thick, bullet passed clean through. (Captain v. Heyking remarks that even an 8 mm. (0·315 in.) iron plate of Krupp's best construction is not absolutely safe against a rifle bullet.)
12. Boxes made of 25 mm. (1 in.) planks placed 0·25 metre (10 in.) apart and filled with sand, bullet passed through.
A similar box, planks 0·20 metre (8 in.) apart, and filled with ordinary stones, the bullet did not pass through.
13. Closed box filled with dry saw-dust, the bullet from the 1888 rifle passed clean through.
14. Closed box filled with wet saw-dust, 1888 rifle used, the lid was forced off.
15. Closed box with boiled starch, 1888 rifle used, the box burst open.
16. Closed box with boiled starch, 1871–84 rifle used, box completely burst open.
17. Closed box with clay, 1888 rifle used, box burst open, the inlet and outlet holes in the wood small, the cover forced off, channel through the clay large, but tapering down towards the point of exit.
18. Closed box with clay, 1871–84 rifle used, box completely burst open.
19. An hermetically sealed tin box filled with water, 1888 rifle used, box burst open.
20. An hermetically sealed tin box filled with water, 1871–84 rifle used, box completely burst open.
21. Pig's bladder filled with water, 1888 rifle used, a grazing shot, the bladder was torn.
22. Pig's bladder filled with water, 1871–84 rifle used, the bladder was completely burst.
23. Open box with boiled starch, 1888 rifle used, the box burst.
24. Cube of moist clay of 230 mm. (9 in.) side, 1871–84 rifle, great bursting effect, especially after penetration, large opening where the bullet came out, 1888 rifle, holes of 6 cm. (2·36 in.) diameter.
25. A horse's head, skinned, but with the brains intact, 1888 rifle used, gaping wound at point of entry (explosive action).
26. A cow's head, brains removed, completely dry, rifle 1888, circular hole of 8 mm. (0·314 in.) diameter.
27. Lungs, suspended loosely, not blown out:—

(*a*) 1871–84 rifle, fissure on entering 9 mm. (0·354 in.) wide and 18 mm. (0·709 in.) long; fissure on issuing 32 mm. (1·26 in.) wide, 48 mm. (1·89 in.) long.
(*b*) 1888 rifle, fissure on entering 9 mm. (0·354 in.) wide and 12 mm. (0·472 in.) long; fissure on entering 10 mm. (0·394 in.) wide, 15 mm. (0·59 in.) long.

28. Hollow bones of the leg (tibia), fresh :—

(*a*) 1871–88 rifle (diaphysen shot), complete bursting action two portions).
(*b*) 1888 rifle, (*a*) (epiphysen shot), explosive action on entering; (*b*) the bullet struck on the epiphysen line, circular opening and splintering of the bone.

The far less explosive action of the new small-bore toughened lead bullet with an envelope was most apparent. A wish was expressed that these highly instructive experiments might be the first of a series, which would tend to bring the combatant and Medical Officers together in a mutual desire to arrive at the real effect of newly-discovered missiles upon the human frame.

NOTICES OF BOOKS.

Rulers of India. Lord William Bentinck. By DEMETRIUS BOULGER. Oxford: Clarendon Press, 1892. Pp. 214. Size $7\frac{3}{4}'' \times 5\frac{1}{4}'' \times \frac{3}{4}''$. Weight under 1 lb. Price 2*s.* 6*d.*

This is a record of a remarkable career. Born in 1774, Lord William entered the Coldstream Guards at the age of seventeen, became Captain in the 2nd Light Dragoons the following year, and at the age of twenty was Lieutenant-Colonel of the 24th Light Dragoons, and served in Flanders on the Staff of the Duke of York. As Military Attaché he accompanied the army of Marshal Suwarrow on its campaign in Northern Italy and Switzerland, and was present in the same capacity with the Austrian Army at the Battle of Marengo, 1800. Marrying in 1803, he was appointed that year, at the age of twenty-nine, Governor of Madras; but here the work was of a very harassing character, and the Mutiny of Vellore was the chief cause of its termination by his recall in 1807. Under seventeen years he had attained the rank of Major-General, and as such was employed in Spain under Sir H. Burrard, Sir J. Moore, and, as Lieutenant-General, under Sir A. Wellesley. His services in command of the British troops in Sicily, to which he was appointed in 1811, are within the recollection of most readers of the Peninsular War; but he was hardly a very successful military commander. In 1827 Lord William became Governor-General of India, in succession to Lord Amherst, and during his seven years tenure of office he effected great reforms, including the abolition of *Satí*, the destruction of the pest of Thags, and, moreover, inaugurated a new education policy. It was during his administration, also, that the difficult question of the renewal of the Company's Charter was settled in 1833. The book is well and interestingly written.

Navigation Astronomique Simplifiée. Par A. COLLET, Capitaine de Frégate, Répétiteur à l'École Polytechnique. Paris: Gauthier Villars et Fils. Pp. 24, with tables. Size $13'' \times 10'' \times \frac{1}{8}''$. Weight under 19 ozs. Price 8*s.*

Everyone concerned with the navigation of the rapid modern steamship can hardly fail to be impressed with the vital importance of a frequent determination of their ship's position as nearly as may be, or at least, if nearing the land, the bearing of some point thereon which it may be desirable to make without delay.

Under such circumstances, when both the latitude and the longitude are, at best, doubtful values, the well-known "Sumner's method" becomes one of the most practically useful problems of nautical astronomy.

Commander Collet, of the French Navy, who has already published some excellent works on the deviation of the compass, has, together with other of his countrymen, recognized this fact, and "Nautical Astronomy Simplified" is the result. The object of the book is to provide a method of obtaining the "Sumner lines," and thence the position of the ship, without logarithms, thus adding to the methods generally in use.

In order to obtain this result, the author employs Sir William Thomson's tables, from which, after a short calculation, the longitude and azimuth necessary to obtain the Sumner line may be obtained, without using the logarithms required for the ordinary longitude by chronometer and azimuth.

This work must be commended for the thoroughness with which it has been wrought out, and is well worthy of a careful examination by those interested in the subject of which it treats.

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"The visitor will, perhaps, be more interested in the costly and magnificent electrical apparatus used in the consulting rooms, and should he elect to try an electric dry bath he will only have to step upon an insulated platform, when, by the movement of a switch, he will find himself completely invaded by the subtle force, and will, in a few minutes experience a delightful sense of invigoration and exhilaration. There are also other objects of interest too numerous to mention, but which will tend to make the sceptic feel that his visit has not been in vain, for besides proving his old erroneous ideas completely dissipated, he will awake to the fact that there is a far larger scope for the application of electricity than he ever imagined. There is no charge for consultation, either personally or by letter. Those who cannot call at the Company's Electropathic and Zander Institute, 52, Oxford Street, London, W., should write at once for pamphlet and book of testimonials, which will be forwarded to any address on application free of charge."—Reprinted from the *Norwich Argus.*

TO WEAK AND LANGUID SUFFERERS.

If nervous or organic weakness prostrates you, or you are otherwise rendered incapable, through illness, of enjoying the many pleasures of life, you need no longer be morbid; you have only to inquire personally or by letter, into the marvellous restorative powers of HARNESS' ELECTROPATHIC BELTS to be satisfied that you can

CURE YOURSELVES WITHOUT PHYSIC

or poisonous drugs—by Nature's own simple and certain remedy—Electricity, safely and scientifically applied to the system by wearing one of these genuine health appliances.

HARNESS' ELECTROPATHIC BELT.

HAS CURED THOUSANDS OF MEN AND WOMEN.

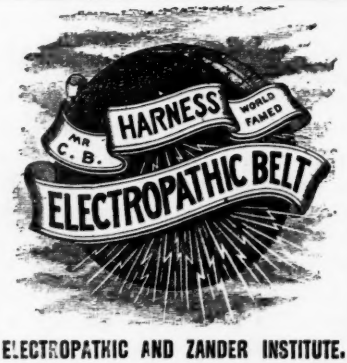
This genuine appliance is comfortable in wear, and will speedily invigorate the debilitated constitution, assist digestion, give strength to every nerve and muscle of the body, and effectually prevent chills and rheumatic pains. It is a simple remedy: but it is nevertheless a most reliable one; and the number of unsolicited testimonials we have received amply prove that we do not exaggerate when we say that HARNESS' ELECTROPATHIC BELTS have completely cured thousands of men and women in all parts of the world.

Pamphlets Free.	Thousands of Testimonials.	Consultation Free.

CORPULENCE & GENERAL DEBILITY.

MRS. JACOBS, 4, Newcastle St., London, E., writes, "Since wearing your Electropathic Belt I have undergone a complete change for the better. In fact, I am quite another woman. When first commencing to wear the Belt I measured 40 inches round the waist and now I am considerably reduced. At the same time I also suffered from *feelings of depression* and a general *disturbance of the nervous system*, but these *painful symptoms have quite gone away.*"

Note only Address, and call or write at once—



ELECTROPATHIC AND ZANDER INSTITUTE.
Sole Proprietors,
THE MEDICAL BATTERY CO., LD.

KIDNEY DISEASE.

HENRY CHARLES, ESQ., Milbury House, Fawcett Rd., Southsea, writes, "Since wearing your Electropathic Belt, I am pleased to say I am much better in every respect. Before purchasing it I suffered from Stone and Kidney disorder for fifteen years. I then went under an operation for Stone, in the Royal Portsmouth Hospital, at Southsea; the stone weighed 2½ ozs. I am thankful to tell you that I am quite satisfied with the Belt, and my back is very much stronger since wearing it than it has been for years."

RHEUMATISM AND INDIGESTION.

REV. E. WARDLE, Villa Rosa, Veytaux, Montreux, Switzerland, writes, "Will you kindly forward me one of your Electropathic Belts of medium strength at an early date? I wore one some twelve months ago, and found it beneficial in case of Rheumatism and Indigestion."

52, OXFORD ST., LONDON, W.

Cheques and Postal Orders should be crossed "London and County Bank."

Extract from the Bye-laws.

Section II.—Composition.

1. Princes of the Blood Royal; Lords Lieutenant of Counties; Governors Colonies and Dependencies; Officers of the Army, Navy, Marines, Her Majesty's East Indian Military and Naval Forces, Militia, Yeomanry, Royal Naval Reserve, and Volunteer Corps shall be entitled to become Members, *without ballot*, on payment of the Entrance Fee and Annual Subscription.

N.B. Any Officer coming within the above definition, who may wish to become a Member of the Institution, can do so by copying one of the subjoined Forms, and inclosing it to the Secretary:—

Form for Becoming an Annual Subscriber.

_____ 18

It is my desire to become a Member of the Royal United Service Institution; and I hereby request and authorise my Agents [or Bankers], Messrs. _____, to pay my Entrance Fee (£1) and Annual Subscription (£1) now, and as it becomes due on the 1st of January in each year to the Secretary of the Institution.

_____ Signature.

_____ Qualification for Membership.

Form for Becoming a Life Subscriber.

It is my desire to become a Life Member of the Royal United Service Institution; and I hereby authorise my Agents [or Bankers], Messrs. _____ to pay my Entrance Fee (£1) and Life Subscription (£9) to the Secretary of the Institution.

_____ Signature.

_____ Qualification for Membership.

2. Ex-Governors of Colonies and Dependencies, Retired Officers, Deputy Lieutenants of Counties, Civil Functionaries who are or have been attached to the Naval and Military Departments, the Master, Deputy Master, and Elder Brethren of the Trinity House, and Army and Navy Agents, shall be *eligible* to become Members by *Ballot*.

3. Gentlemen above the age of fifteen, whose names are on the list of the Commander-in-Chief for Commissions in the Army, or who are probationary for offices connected with the Naval and Military Professions, shall be *admissible*, by *Ballot*, to become Provisional Members from year to year, on payment of the Annual Subscription; and after they obtain their appointments, they may become ordinary Members on payment of the Entrance Fee.

N.B. Members admissible by Ballot must be proposed and seconded by two Members of the Institution, and their names will be submitted to the Council for election. Ballot papers may be obtained at the Institution.

Form of Bequest.

I give and bequeath unto The Royal United Service Institution, *situated in Whitehall Yard, London, the sum of* _____ *to be applied in and towards carrying on the designs of the said Institution, such Legacy to be paid out of such part of my personal Estate not specifically bequeathed as the law permits to be appropriated by Will to Charitable Purposes.*

CAPTAIN JAMES,

5, Lexham Gardens, Cromwell Road, London, W.,

PREPARES PUPILS FOR ALL ARMY EXAMINATIONS AND THE UNIVERSITIES.

SUCCESSES IN 1889-90-91.

INDIAN CIVIL SERVICE.

ELEVEN Passed. Places taken include 2nd, 6th, 7th, 8th, 9th, &c., on the various lists. Places taken in the various subjects comprise—First, 3rd, 4th, 5th, 6th, and 7th Political Economy; First, 4th Logic; 2nd, 3rd, 4th Mechanical Philosophy; 3rd French; 4th German; 5th Latin; 10th Mathematics; 8th, 10th (twice) Italian; 3rd Composition; 4th, 6th (twice), 10th History; 2nd, 3rd, 4th, 5th, 6th, 10th Literature.

WOOLWICH.

TWENTY-ONE Passed, including 6th and 7th on the List. Places taken in the various subjects comprise—First mathematics; 5th Latin; 6th, 7th, and 8th German; 3rd Greek; 2nd and 3rd History; First Chemistry; First Geology; 6th and 8th Geometrical Drawing.

SANDHURST.

ONE HUNDRED and SEVEN Passed, including two 1sts, four 2nds, three 3rds, &c., on the various lists. Places taken in the different subjects include—2nd and 5th Mathematics; 1st (twice) and 4th (twice) in Latin; 1st, 2nd, and 4th French; 3rd, 5th, and 6th Greek; 1st (highest marks under present regulations), 4th, 6th History; 1st, 3rd (twice), 4th, and 5th Chemistry; 1st (thrice) and 2nd Geology; 1st (twice) in Freehand; and 1st and 2nd (twice) in Geometrical Drawing.

MILITIA LITERARY.

SIXTY-FOUR Passed. Places taken include 1st (twice), 2nd, 3rd, 4th, &c. Places taken in the various subjects are—2nd (thrice) in Mathematics; 1st (twice) and 3rd Latin; 2nd and 3rd (twice) French; 3rd (twice), 4th, 5th, and 6th German; 1st, 2nd, and 5th Greek; 3rd, 4th (twice), 5th (twice) History; 1st Chemistry; 1st (twice), 2nd (twice), 4th, and 5th (twice) Geology; 1st, 2nd, and 4th Freehand; 1st, 2nd, 3rd, and 4th (twice) Geometrical Drawing. In April, 1892, ALL sent up passed. Places taken were 5th, 35th, 46th, 48th, and 54th.

N.B.—These numbers do not comprise those who qualified at the Sandhurst Examination.

MILITIA MILITARY COMPETITIVE.

ONE HUNDRED and FORTY Passed. Places taken include SEVEN 1sts and three 2nds on the various lists. Places taken in Topography, Law, Tactics, and Fortification include four 1sts, six 2nds, six 3rds, four 4ths, &c.

In March, 1892, of the Sixty-two Successful Candidates SEVENTEEN passed from Captain James.

Place.	Name.	Marks.	Place.	Name.	Marks.
First ...	F. Godfrey Faussett ...	1,935	*17th ...	R. H. Hunter Weston ...	1,850
6th ...	W. C. C. Ash	1,896	20th ...	E. C. F. Wodehouse ...	1,835
7th ...	C. B. Prowse	1,887	24th ...	W. Marriott Dodington	1,808
8th ...	J. C. Mack	1,886	27th ...	H. G. T. Bright	1,795
9th ...	C. D. Christopher ...	1,881	29th ...	T. K. Gaskell	1,792
	A. R. C. Savile	1,881	34th ...	H. S. Scott Harden ...	1,751
12th ...	A. J. Lean...	1,876	*42nd ...	C. H. Pringle	1,709
15th ...	D. J. Propert	1,858			
	CAVALRY.			ARTILLERY.	
*6th ...	M. M. Little	1,865	4th ...	B. W. Holman	1,865

* Prepared at the Country Branch.

In addition to the London Classes, a Country Branch for resident and non-resident pupils has been opened for the Militia Competitive at Camberley, under the personal superintendence of Lieut.-Col. W. R. Fox, late R.A. (Honours) Staff College, assisted by Lieut.-Colonel Cooper King, late R.M.A. 1st Staff College.

The CIVIL STAFF embraces Thirty-three Gentlemen, of whom Twenty are University Graduates in high honours. The Military Staff includes Twelve Officers, of whom Five are Staff College Graduates in honours. The total number of Forty-five is far larger than will be found at any other establishment in England, and is sufficient to give that individual instruction to the pupils to which the above remarkable successes are due, and which for many years past have exceeded the results of any other tutor or school.

Captain James can be seen daily at twelve noon.

HARRISON AND SONS, PRINTERS IN ORDINARY TO HER MAJESTY, ST. MARTIN'S LANE.